



TOOELE  
ARMY  
DEPOT

**FINAL**

**CORRECTIVE MEASURES STUDY  
REPORT  
GROUP B SUSPECTED RELEASES SWMUs  
TOOELE ARMY DEPOT  
TOOELE, UTAH**

**Contract No. DACA31-94-D-0060  
Delivery Order No. 1**

Prepared for:

TOOELE ARMY DEPOT  
Tooele, Utah

Prepared by:

**URS**

**Dames & Moore**

7101 Wisconsin Avenue, Suite 700  
Bethesda, Maryland 20814

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**OCTOBER 2000**



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## ACRONYMS AND ABBREVIATIONS

AED	Ammunition and Engineering Directorate
bgs	Below ground surface
BRAC	Base Realignment and Closure
CAO	Corrective action objective
CAP	Corrective Action Permit
CCRs	Covenants, Conditions, and Restrictions
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measures Study
COC	Contaminant of concern
COPC	Contaminant of potential concern
days/yr	Days per year
DCD	Deseret Chemical Depot
DOT	U.S. Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
FFA	Federal Facility Agreement
ft <sup>2</sup>	Square foot
HI	Hazard index
IRP	Installation Restoration Program
IWL	Industrial Waste Lagoon
LDR	Land disposal restriction
µg/dL	Microgram per deciliter
µg/g	Microgram per gram
MNA	Monitored natural attenuation
NE	Not evaluated



## **ACRONYMS AND ABBREVIATIONS (cont'd)**

NPL	National Priorities List
O&M	Operation and maintenance
RA	Risk assessment
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RME	Reasonable maximum exposure
SAIC	Science Applications International Corporation
SVOC	Semivolatile organic compound
SWERA	Site-wide ecological risk assessment
SWMU	Solid waste management unit
TCLP	Toxicity characteristic leaching procedure
TEAD	Tooele Army Depot
TEAD-N	Tooele Army Depot - North Area
TEAD-S	Tooele Army Depot - South Area
TECA	Tooele Chemical Activity
TPHC	Total petroleum hydrocarbon
TSDF	Treatment, storage, and disposal facility
UAC	Utah Administrative Code
UDEQ	Utah Department of Environmental Quality
USAEC	U.S. Army Environmental Center (formerly USATHAMA)
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency (now USAEC)
UTS	Universal treatment standards
VOC	Volatile organic compound
yd <sup>3</sup>	Cubic yard

## EXECUTIVE SUMMARY

This document is the Corrective Measures Study (CMS) Report for the Group B Suspected Releases Solid Waste Management Units (SWMUs) at Tooele Army Depot (TEAD; formerly the North Area), Tooele, Utah. It has been prepared for TEAD in association with the U.S. Army Environmental Center (USAEC), in accordance with the Resource Conservation and Recovery Act (RCRA) Post Closure Monitoring and Corrective Action Permit (CAP; UT3213820894) issued to TEAD by the State of Utah.

The purpose of the CMS Report is to recommend a corrective measures alternative for each SWMU.

The CMS Work Plan (Dames & Moore, 2000) evaluated the SWMUs that required additional consideration for corrective measures under State of Utah Administrative Code (UAC) R315-101-1(b)(4) because they exceeded one of the following exposure limits, defined in UAC R315-101-1(b)(2):

- Residential cancer risks greater than  $1 \times 10^{-6}$
- Residential noncancer hazards greater than 1.0.

In addition, if blood lead levels from exposure at a SWMU exceeded the Centers for Disease Control and Prevention (CDC) guideline of 10 micrograms per deciliter ( $\mu\text{g/dL}$ ), corrective measures were considered.

According to the State of Utah Administrative Code (UAC) R315-101-1(b)(4), a site management plan must be prepared for SWMUs that pose a human health cancer risk greater than  $1 \times 10^{-6}$  or a noncancer hazard index (HI) greater than 1.0 under the hypothetical future residential land use scenario. The RCRA CMS Work Plan (Dames & Moore, 2000) and the CMS Report fulfill the requirement for a site management plan.

For SWMUs that pose a significant threat to human health or the environment under current (and likely future) land use conditions, both active corrective measures (i.e., treatment technologies) and management measures must be evaluated. For SWMUs that do not pose an unacceptable threat to human health or the environment under current (and likely future) land use conditions, the CMS may evaluate management measures such as land use or deed restrictions.

The CMS Report presents detailed analyses of the corrective measures alternatives developed in the CMS Work Plan (Dames & Moore, 2000) for the management of identified risks at the following Group B SWMU areas:

- Sandblast Areas (SWMU 4)
  - Building 600
  - Buildings 615/617.

- Ammunition and Engineering Directorate (AED) Demilitarization Test Facility (SWMU 19).
- Defense Reutilization and Marketing Office (DRMO) Storage Yard (SWMU 26).
- Drum Storage Area (SWMU 29).
- Used Oil Dumpsters (SWMU 46)
  - Building 522 (south end)
  - Building 602 (southwest corner)
  - Building 611 (northwest corner)
  - Building 619 (south alley).

The Phase II RFI Report (SAIC, 1997) determined that most of these SWMUs pose an unacceptable human health risk based on a hypothetical future residential land use scenario. Buildings 522, 602, and 619 of SWMU 46 do not pose a human health cancer risk or unacceptable HI under the hypothetical future residential land use scenario. However, total petroleum hydrocarbon (TPHC) concentrations at these sites warrant action. In this case, *Guidelines for Utah's Tier 1 Risk-Based Corrective Action: Guide for Screening Petroleum-Contaminated Sites* (UDEQ, 1997) is considered when evaluating TPHC levels at SWMUs with TPHC present.

Continued military use is planned for SWMU 19 and Building 522 at SWMU 46. The remaining areas considered in the CMS are located in the Maintenance Area and were transferred from military to private ownership under the Base Realignment and Closure (BRAC) program. As identified in the *Tooele Army Depot Conversion and Reuse Plan* (Tooele County Economic Development Corporation, 1995), the primary land uses planned for the BRAC areas are industrial and commercial. The CMS recommendations are based on these planned land uses.

To identify potential corrective measures alternatives for each of the SWMUs that were determined to pose a human health or environmental risk, the CMS Work Plan (Dames & Moore, 2000) developed corrective action objectives (CAOs) for the contaminants of potential concern (COPCs) in the various media under the assumed future land use scenarios. The CAOs included quantitative risk-based objectives and qualitative, regulatory-driven objectives. COPCs were compared to quantitative CAOs to identify contaminants of concern (COCs). The CMS Work Plan identified corrective measures – which may include treatment technologies and management measures – that meet the qualitative and quantitative CAOs, and assembled them into corrective measures alternatives.

The following corrective measures alternatives are considered for the Group B SWMUs:

- SWMU 4 – Sandblast Areas
  - Building 600
    - Deed restrictions.
  - Buildings 615/617
    - Deed restrictions.
- SWMU 19 – AED Demilitarization Test Facility
  - Land use restrictions.
- SWMU 26 – DRMO Storage Yard
  - Deed restrictions.
- SWMU 29 – Drum Storage Area
  - Deed restrictions.
- SWMU 46 – Used Oil Dumpsters
  - Building 522 (south end)
    - Monitored natural attenuation
    - Excavation and off-post treatment/disposal.
  - Building 602 (southwest corner)
    - Monitored natural attenuation
    - Excavation and off-post treatment/disposal.
  - Building 611 (northwest corner)
    - Monitored natural attenuation and deed restrictions
    - Excavation, off-post treatment/disposal, and deed restrictions.
  - Building 619 (south alley)
    - Monitored natural attenuation
    - Excavation and off-post treatment/disposal.

The detailed evaluation of each corrective measures alternative considers technical criteria (including performance, reliability, implementability, and safety), protection of human health, environmental assessment, administrative feasibility, and cost, as outlined below:

- Technical criteria
  - Performance – Evaluates the ability of the alternative to perform its intended function and to meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). Factors affecting performance – including site and waste characteristics – are also considered, along with the length of time the alternative maintains its intended level of effectiveness.
  - Reliability – Describes the long-term effectiveness and permanence of each alternative, and evaluates the adequacy of the treatment technology based on performance at similar sites, operation and maintenance (O&M) requirements, long-term environmental monitoring needs, and residuals management requirements.
  - Implementability – Assesses the technical and institutional feasibility of executing an alternative, including constructability, permit and legal/regulatory requirements, and availability of materials. This criterion also addresses the length of time from implementation of the alternative until beneficial effects are realized.
  - Safety – Considers potential threats to workers, off-post residential communities, and the environment during implementation of the corrective measure.
- Human health assessment – Evaluates the extent to which each alternative protects human health. This criterion considers the classes and concentrations of contaminants left onsite, potential exposure routes, and potentially affected populations. Residual contaminant concentrations are also compared to existing criteria, standards, and guidelines.
- Environmental assessment – Evaluates short- and long-term effects of the corrective measure on the environment, including adverse impacts to environmentally sensitive areas.
- Administrative feasibility – Considers compliance with applicable Federal, State, and local environmental and public health standards, requirements, criteria, or limitations.
- Cost – Considers capital and annual O&M costs for each alternative.

Based on the detailed evaluations and comparative analysis conducted in this CMS, the recommended corrective measures alternatives for each Group B SWMU are as follows:

- Deed restrictions at Building 600, Sandblast Areas (SWMU 4).
- Deed restrictions at Buildings 615/617, Sandblast Areas (SWMU 4).
- Land use restrictions at the AED Demilitarization Test Facility (SWMU 19).
- Deed restrictions at the DRMO Storage Yard (SWMU 26).
- Deed restrictions at the Drum Storage Area (SWMU 29).
- Excavation and off-post treatment/disposal at Building 522 (south end), Used Oil Dumpsters (SWMU 46).
- Excavation and off-post treatment/disposal at Building 602 (southwest corner), Used Oil Dumpsters (SWMU 46).
- Excavation, off-post treatment/disposal, and deed restrictions at Building 611 (northwest corner), Used Oil Dumpsters (SWMU 46).
- Excavation and off-post treatment/disposal at Building 619 (south alley), Used Oil Dumpsters (SWMU 46).

Table ES-1 summarizes the corrective measures alternatives evaluated in the CMS for the Group B SWMUs; also included are summaries of the results of the human health and ecological RAs, potential effects on groundwater, and identified COCs.

The CMS Report addresses how the alternatives reduce exposure to contamination, contaminant concentration, or contaminant migration.

These recommended corrective measures alternatives for Group B are presented to the public in the Decision Document. Once the recommendations are accepted, TEAD's RCRA Post Closure Monitoring and Corrective Action Permit will be modified to include the approved CMS Report and Decision Document.

TABLE ES-1

## Summary of CMS, Group B Suspected Releases SWMUs

SWMU	Results of Human Health RA (a)						Results of Ecological RA (b)	Potential Effects on Groundwater?	COCs (c)	Corrective Measures Alternatives (d, e)
	Industrial/Military			Construction Worker						
	Cancer Risk	HI	Blood Lead	Cancer Risk	HI	Blood Lead				
Sandblast Areas, Building 600 (SWMU 4)	2H10 <sup>-6</sup>	0.2	NE	1H10 <sup>-7</sup>	0.06	NE (f)	Low risk	No	Lead Benzo(a)anthracene	Deed restrictions (g)
Sandblast Areas, Buildings 615/617 (SWMU 4)	3H10 <sup>-6</sup>	0.1	6	7H10 <sup>-8</sup>	0.03	8	Low risk	No	Chromium Lead Benzo(a)anthracene Benzo(a)pyrene	Deed restrictions (g)
AED Demilitarization Test Facility (SWMU 19)	4H10 <sup>-7</sup>	0.005	NE	NE	NE	NE	Low risk	No	None	Land use restrictions (g)
DRMO Storage Yard (SWMU 26)	6H10 <sup>-6</sup>	0.8	8	1H10 <sup>-6</sup>	0.2	13	Low risk	No	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene	Deed restrictions (g)
Drum Storage Area (SWMU 29)	1H10 <sup>-6</sup>	0.3	NE	1H10 <sup>-6</sup>	0.09	NE	Low risk	No	Benzo(a)pyrene	Deed restrictions (g)
Used Oil Dumpsters, Building 522 (south end) (SWMU 46)	0	1H10 <sup>-6</sup>	4	0	3H10 <sup>-7</sup>	4	Low risk	No	TPHCs	Monitored natural attenuation Excavation and off-post treatment/ disposal
Used Oil Dumpsters, Building 602 (southwest corner) (SWMU 46)	3H10 <sup>-10</sup>	3×10 <sup>-3</sup>	NE	1H10 <sup>-11</sup>	7×10 <sup>-4</sup>	NE	Low risk	No	TPHCs	Monitored natural attenuation Excavation and off-post treatment/ disposal
Used Oil Dumpsters, Building 611 (northwest corner) (SWMU 46)	2H10 <sup>-10</sup>	0.07	4	7H10 <sup>-11</sup>	0.02	4	Low risk	No	TPHCs Lead	Monitored natural attenuation and deed restrictions Excavation, off-post treatment/ disposal, and deed restrictions
Used Oil Dumpsters, Building 619 (south alley) (SWMU 46)	5×10 <sup>-11</sup>	5×10 <sup>-4</sup>	NE	2×10 <sup>-12</sup>	1×10 <sup>-4</sup>	NE	Low risk	No	TPHC	Monitored natural attenuation Excavation and off-post treatment/ disposal

- (a) Phase II RFI Report (SAIC, 1997). Results of human health RA under realistic future land use scenarios (continued military use, industrial use, and construction worker scenarios); HI = noncancer hazard index; blood lead levels are expressed in micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ) for 95 percent of the population.
- (b) Site-Wide Ecological Risk Assessment (SWERA; Rust E&I, 1997).
- (c) Human health contaminants of concern.
- (d) The preferred corrective measures alternatives are italicized.
- (e) The term “deed restrictions” is used for BRAC sites; “land use restrictions” is used for non-BRAC sites. Although the result is similar (i.e., to prevent future residential use of a site), the process by which restrictions are applied differs depending on the ownership of the site (military or private).
- (f) Not evaluated.
- (g) Only deed or land use restrictions are considered because the identified COCs produce insignificant risks to human health and the environment.

## 1.0 INTRODUCTION

This document is the Corrective Measures Study (CMS) Report for the Group B Suspected Releases Solid Waste Management Units (SWMUs) at Tooele Army Depot (TEAD), formerly Tooele Army Depot-North Area (TEAD-N), Tooele, Utah. It has been prepared for TEAD in association with the U.S. Army Environmental Center (USAEC), under the requirements of Contract No. DACA31-94-D-0060, Delivery Order No. 1, Alternatives Development and Decision Documents for TEAD. The CMS Report was developed in accordance with Module VII, Corrective Action, of the Resource Conservation and Recovery Act (RCRA) Post Closure Monitoring Corrective Action Permit (CAP; UT3213820894) issued to TEAD by the State of Utah Department of Environmental Quality (UDEQ) in January 1991.

### 1.1 PURPOSE AND SCOPE

The CMS Report for the Group B SWMUs represents one of the major steps in the RCRA corrective action process of protecting human health and the environment from chemicals released at a facility. In accordance with TEAD and USAEC guidance, the CMS Report is based on the evaluations and conclusions of the Phase II RCRA Facility Investigation (RFI) Report (Science Applications International Corporation (SAIC), 1997) and the CMS Work Plan (Dames & Moore, 2000). The RFI delineates the nature and extent of chemical constituents potentially released to the environment and evaluates potential risks to human health and impacts to the environment. The CMS Work Plan identifies corrective measures alternatives that address the potential risks and hazards at each SWMU.

The purpose of the CMS Report is to analyze the corrective measures alternatives developed in the CMS Work Plan (Dames & Moore, 2000) for the nine Group B SWMU study areas determined in the Phase II RFI Report (SAIC, 1997) to pose a human health risk based on the hypothetical future residential land use scenario or to exceed State of Utah petroleum screening levels. The objective in conducting the CMS is to protect human health and the environment during future land use (i.e., industrial use for sites located within the Base Realignment and Closure (BRAC) program parcel of TEAD and military use for non-BRAC sites). This does *not* include cleaning up the facility to standards that apply for other land uses, such as agriculture or residential development. If other uses are considered in the future, it will be necessary to reevaluate the corrective measures alternatives identified for the Group B SWMUs.

***The CMS Report is intended to be used in conjunction with the CMS Work Plan (Dames & Moore, 2000); most information presented in the CMS Work Plan is not repeated in this report.*** The CMS Work Plan presents a detailed summary of TEAD background, including location, physical characteristics, history, present mission, future use, and previous investigations/regulatory overview. Also included for each SWMU area are descriptions of background, summaries of contamination assessment from the Phase II RFI Report (SAIC, 1997), results of human health and ecological risk assessments (RAs), interim corrective actions (as applicable), identification of corrective action objectives (CAOs) and



contaminants of concern (COCs), qualitative estimates of extent of contamination (as applicable), and development of corrective measures alternatives.

## 1.2 BACKGROUND

TEAD is located in Tooele Valley in Tooele County, Utah, immediately west of the City of Tooele (population 13,887 (1990 census)) and approximately 30 miles southwest of Salt Lake City (Figure 1-1). The U.S. Army Ordnance Department established the Tooele Ordnance Depot in 1942. It was redesignated as TEAD-N in August 1962; also at this time, the former Deseret Chemical Warfare Depot was renamed TEAD-South Area (TEAD-S). Both the North and South Areas of TEAD have been major ammunition storage and equipment maintenance installations that support other U.S. Army installations throughout the western United States. In 1996, TEAD-N and TEAD-S were designated as TEAD and Tooele Chemical Activity (TECA), respectively. In October 1996, TECA was redesignated the Deseret Chemical Depot (DCD).

The current missions of TEAD are:

- To receive, store, issue, maintain, and dispose of munitions
- To provide installation support to attached organizations
- To operate other facilities as assigned.

The mission of maintaining and repairing equipment was discontinued in 1995.

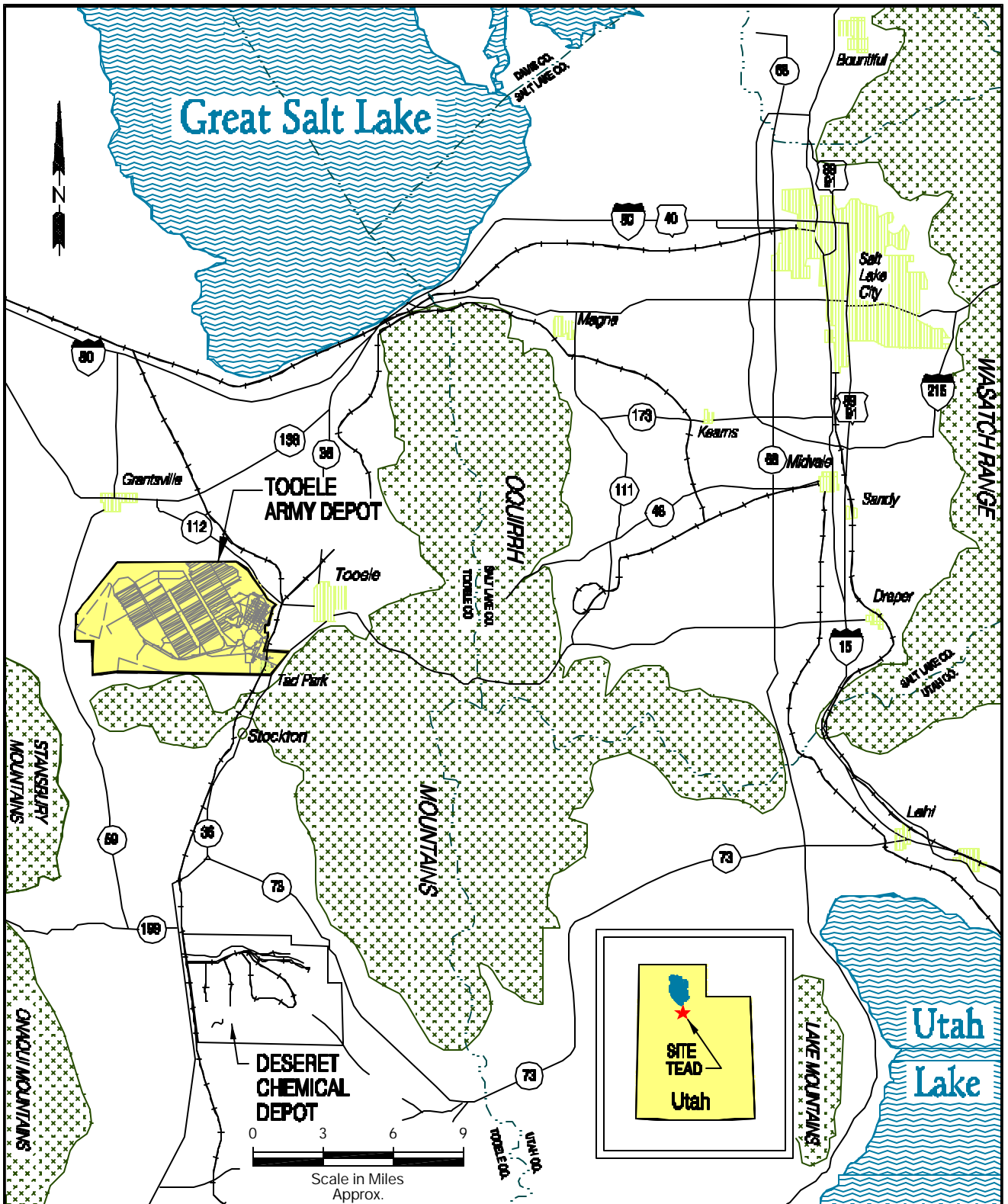
Developed features at TEAD include igloos, magazines, administrative buildings, an industrial maintenance area, military and civilian housing, roads, and vehicle storage hardstands and other allied infrastructure. In 1993, TEAD was placed on the list of military facilities scheduled for realignment under the BRAC program.

As a result of past activities at the installation, TEAD was included in the U.S. Army's Installation Restoration Program (IRP) in 1978. The first component of that program was an Installation Assessment (U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), 1979), which identified a number of known and potential waste and spill sites and recommended further investigations.

In 1984, TEAD was nominated for inclusion on the National Priorities List (NPL) because of the identified hazardous constituents at some of the sites, particularly the Industrial Waste Lagoon (IWL; SWMU 2). However, TEAD was not placed on the NPL until October 1990. In the interim, the U.S. District Court for the State of Utah issued a consent decree to TEAD for groundwater contamination at SWMU 2.

As part of the NPL process, the U.S. Army, U.S. Environmental Protection Agency (EPA) Region 8, and UDEQ signed a Federal Facility Agreement (FFA) in January 1991. The

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SOURCE: RUST E&I, 1995

FIGURE 1-1  
LOCATION MAP OF  
TOOELE ARMY DEPOT  
AND VICINITY

FFA addresses 17 SWMUs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Also in January 1991, TEAD was issued a RCRA Post Closure Permit for the IWL (SWMU 2). The permit included a CAP that required action at 29 SWMUs. Additional SWMUs have since been added to the CAP, which is regulated by UDEQ.

Since the initial assessment of TEAD, a number of environmental investigations have been performed (and are ongoing) under CERCLA or RCRA. At TEAD, these additional investigations have identified 57 sites, including the following Group B SWMUs:

- Sandblast Areas (SWMU 4).
- Ammunition and Engineering Directorate (AED) Demilitarization Test Facility (SWMU 19).
- Defense Reutilization and Marketing Office (DRMO) Storage Yard (SWMU 26).
- Drum Storage Area (SWMU 29).
- Used Oil Dumpsters (SWMU 46).

Figure 1-2 shows the general locations of these SWMU study areas. These sites are managed under the RCRA CAP program. Four other SWMUs and two areas of concern are also designated as Group B sites; however, they are not included in this CMS.

The Phase II RFI Report (SAIC, 1997) determined that the following Group B SWMU study areas either pose a human health risk based on the hypothetical future residential land use scenario or exceed State of Utah petroleum screening levels:

- Sandblast Areas (SWMU 4)
  - Building 600
  - Buildings 615/617.
- AED Demilitarization Test Facility (SWMU 19).
- DRMO Storage Yard (SWMU 26).
- Drum Storage Area (SWMU 29).
- Used Oil Dumpsters (SWMU 46)
  - Building 522 (south end)

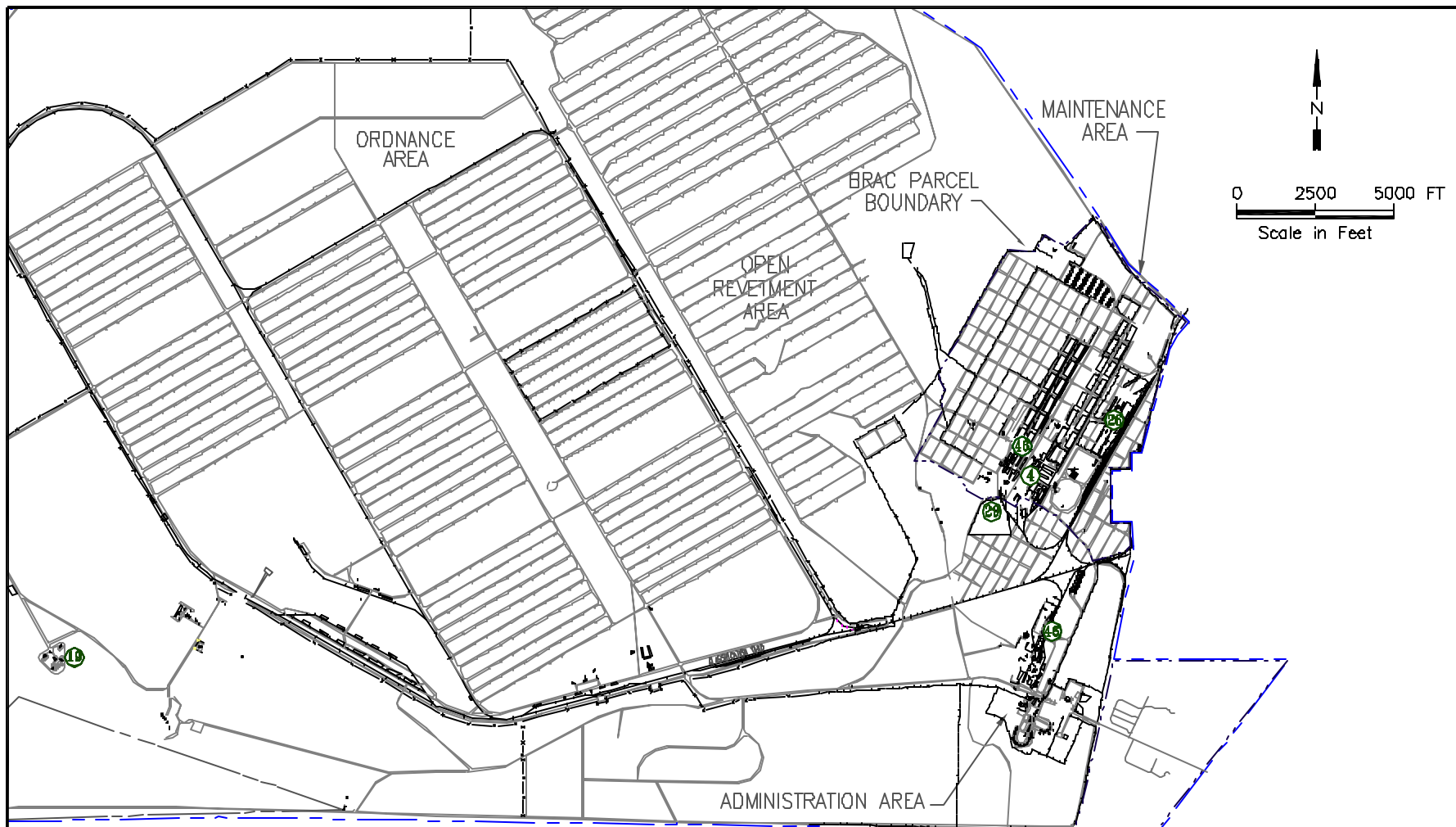
- Building 602 (southwest corner)
- Building 611 (northwest corner)
- Building 619 (south alley).

Continued military use is planned for SWMU 19 and Building 522 at SWMU 46. The remaining sites – which are located in the Maintenance Area – were transferred from military to private ownership under the BRAC program. The *Tooele Army Depot Conversion and Reuse Plan* (Tooele County Economic Development Corporation, 1995) identifies the primary future land uses for the BRAC areas as industrial and commercial. As previously noted, the CMS recommendations are based on these planned land uses.

### 1.3 REPORT ORGANIZATION

The remainder of the CMS Report is organized as follows:

- Description of evaluation criteria used in the detailed analysis of corrective measures alternatives (Section 2.0).
- Summary of pertinent information presented in the Phase II RFI (SAIC, 1997) and the CMS Work Plan (Dames & Moore, 2000) for SWMUs 4, 19, 26, 29, and 46 (Sections 3.0 through 7.0), respectively. This includes a description of the SWMU, the magnitude and extent of contamination, results of the realistic future human health risks and hazards assessment and the ecological RA, CAOs, COCs, and potentially applicable corrective measures alternatives. Each area-specific corrective measures alternative is evaluated in detail based on the evaluation criteria presented in Section 2.0. In addition, corrective measures alternatives for each of the SWMUs are compared, and the recommended alternative is identified.
- Summary of recommended corrective measures alternatives for the nine Group B SWMU study areas (Section 8.0).
- References (Section 9.0).
- Detailed cost estimates for recommended corrective measures alternatives (Appendix A).
- Detailed cost estimates for unrestricted use corrective measures (Appendix B).



Legend	
	SWMU LOCATION AND NUMBER
	TEAD BOUNDARY
	BRAC PARCEL BOUNDARY

#### GROUP B SWMUS

- #4 SANDBLAST AREAS
- #19 AED DEMILITARIZATION TEST FACILITY
- #26 DRUM STORAGE YARD
- #29 DRUM STORAGE AREA
- #46 USED OIL DUMPSTERS

NOTE: THE VARIOUS LOCATIONS OF SWMU 46, WHICH CONSISTS OF 18 DUMPSTER LOCATIONS AND ONE DIESEL OIL SPILL IN THE MAINTENANCE AND ADMINISTRATION AREAS, ARE NOT SHOWN. SEE FIGURES 7-1 AND 7-2 FOR THE LOCATIONS OF SWMU 46.

FIGURE 1-2  
LOCATION OF GROUP B  
SUSPECTED RELEASES SWMUs  
TOOELE ARMY DEPOT



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## 2.0 DESCRIPTION OF EVALUATION CRITERIA

The CMS Work Plan (Dames & Moore, 2000) identifies corrective measures alternatives for the Group B SWMU areas. This is accomplished by developing CAOs for the contaminants of potential concern (COPCs) in the various media under the assumed future land use scenarios. The CAOs include quantitative risk-based objectives and qualitative regulatory-driven objectives. They are based on land use and potential receptor assumptions, exposure pathways, results of human health RAs, health effects criteria, and background sample results. The CAOs are developed in accordance with Utah Administrative Code (UAC) R315-101, including the “Principle of Non-Degradation”; EPA guidance (USEPA, 1991); the human health RA for the Group B SWMUs (SAIC, 1997); the Revised Final Site-Wide Ecological Risk Assessment (SWERA; Rust E&I, 1997); and U.S. Army policy (Radkiewicz, 1995). The COPCs are then compared to quantitative CAOs to identify COCs.

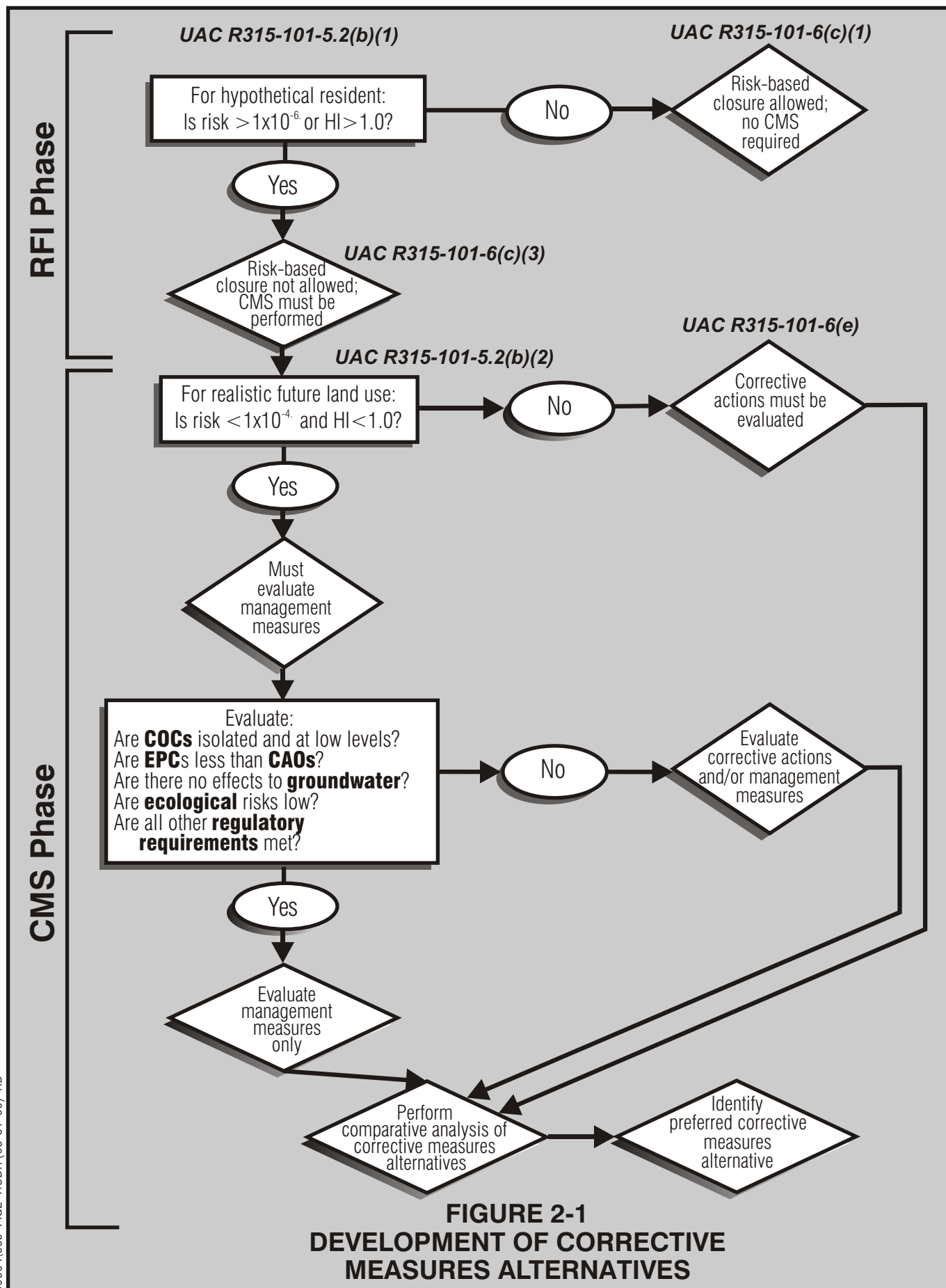
Corrective measures may include management measures or treatment technologies that meet the CAOs and address the COCs; these measures are assembled into corrective measures alternatives. The alternatives are developed according to RCRA guidance on performing a CMS (Sperber, 1996) and UDEQ regulations. The CMS Work Plan (Dames & Moore, 2000) describes the methodology in detail; Figure 2-1 outlines the alternatives development procedure.

RCRA criteria are used to evaluate each of the corrective measures alternatives identified in the CMS Work Plan (Dames & Moore, 2000). In accordance with RCRA guidance (Sperber, 1996) and Module VII of the RCRA Part B Permit for TEAD, the detailed evaluation of each corrective measures alternative presented in Sections 3.0 to 7.0 considers technical criteria (including performance, reliability, implementability, and safety), protection of human health, protection of the environment, administrative feasibility, and cost, as defined below:

- Technical criteria
  - Performance – Evaluates whether the corrective measures alternative can perform its intended function and meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000), including compliance with Federal, State, and local regulations. This criterion considers site and waste characteristics, and also the length of time the alternative maintains its intended level of effectiveness.
  - Reliability – Describes the long-term effectiveness and permanence of each alternative. This criterion evaluates the adequacy of the corrective measure based on performance at similar sites, operation and maintenance (O&M) requirements, long-term environmental monitoring needs, and residuals management requirements.

- Implementability – Assesses the technical and institutional feasibility of executing a corrective measures alternative, including constructability, permit and legal/regulatory requirements, availability of materials, and length of time from implementation to realization of beneficial effects.
- Safety – Considers the potential threats to workers, nearby communities, and the environment during implementation of the corrective measure.
- Human health assessment – Evaluates the extent to which each alternative protects human health. This criterion considers the classes and concentrations of contaminants left onsite, potential exposure routes, and potentially affected populations. Residual contaminant concentrations are also compared to existing criteria, standards, or guidelines.
- Environmental assessment – Evaluates short- and long-term effects of the corrective measure on the environment, including adverse impacts to environmentally sensitive areas.
- Administrative feasibility – Considers compliance with applicable Federal, State, and local environmental and public health standards, requirements, criteria, or limitations.
- Cost – Presents capital and annual O&M costs for each corrective measures alternative. Capital costs include direct and indirect costs. Annual O&M costs typically include labor, maintenance, energy, and sampling/analysis. For purposes of comparison, costs are presented in terms of present worth (i.e., the current value of a future expenditure). The cost estimates are based on conventional cost estimating guides, vendor information, and engineering judgment. Appendix A presents detailed cost estimate tables.

The CMS Report addresses how the alternatives reduce exposure to contamination, contaminant concentration, or contaminant migration.





### **3.0 SANDBLAST AREAS (SWMU 4)**

Section 3.0 evaluates corrective measures alternatives for the Sandblast Areas (SWMU 4; Figure 3-1). Data from the CMS Work Plan (Dames & Moore, 2000), the human health RA (SAIC, 1997), and the SWERA (Rust E&I, 1997) are also summarized below. SWMU 4 includes two separate sandblast areas (Building 600 and Buildings 615/617), both of which are located within the BRAC parcel.

#### **3.1 BUILDING 600**

##### **3.1.1 Summary of RAs and CMS Work Plan**

Vehicle maintenance – including painting, stripping, and sandblasting using three types of media (steel grit, ground walnut shells, and glass beads) – was conducted in Building 600. Wastes included spent sandblast media and paint stripping solutions (including phosphoric acid, hydrochloric acid, and sodium hydroxide). Sandblasting equipment had been removed at the time of the Phase II RFI (SAIC, 1997).

The Phase II RFI (SAIC, 1997) identified unacceptable risks to human health at Building 600 under the hypothetical future residential land use scenario. Therefore, according to EPA guidance and UAC R315-101-6(d), this area of SWMU 4 is included in the CMS process, and corrective measures must be evaluated. However, the human health RA identified no unacceptable risks or hazards for the reasonably anticipated future industrial and construction worker scenarios.

No groundwater monitoring was conducted at SWMU 4. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater (approximately 300 feet below ground surface (bgs)).

The SWERA (Rust E&I, 1997) determined that the contaminants at Building 600 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition, the Phase II RFI (SAIC, 1997) concluded that the habitat at SWMU 4 and adjacent areas is insufficient to support an animal population.

The CMS Work Plan (Dames & Moore, 2000) identified lead and benzo(a)anthracene as COCs in surface soil at Building 600. The exposure point concentration (EPC) for benzo(a)anthracene is well below its CAO, and it does not result in a significant health risk. In the case of lead, the EPC of 1,820 micrograms per gram (µg/g) slightly exceeds the CAO. As discussed in Appendix A of the CMS Work Plan, the CAO for lead (1,800 µg/g) corresponds to a 95<sup>th</sup> percentile blood lead level of 10 micrograms per deciliter (µg/dL). Thus, the EPC for lead results in a blood lead level approximately equal to this CDC target level, which is consistent with the results of the human health RA in the Phase II RFI (SAIC, 1997).

An evaluation was performed in Appendix F of the CMS Work Plan (Dames & Moore, 2000) to determine if the locations of COCs are surrounded by other contaminant detections below CAOs, or are single isolated detections. The evaluation determined that benzo(a) anthracene and lead at Building 600 are present only in isolated surface soil samples at low levels and are not a pervasive problem across the site. Each COC was detected at a concentration only slightly above its CAO and at one location only.

The CAOs for Building 600 are:

- To ensure that – if the identified industrial land use scenario changes in the future to residential or other use – appropriate measures are taken to adequately protect human health and the environment.
- To comply with UAC R315-101 and all its parts.

Based on the evaluation of risks and hazards to human health and the environment, the identified COCs, and regulatory requirements, only management measures are evaluated for Building 600. The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternative for this area of SWMU 4:

<b>SANDBLAST AREAS (SWMU 4), Building 600</b>
<b>Alternative 1 – Deed restrictions</b>
Impose deed restrictions to prevent residential development.

Table 3-1 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternative identified for Building 600 in the CMS Work Plan (Dames & Moore, 2000).

### 3.1.2 Detailed Evaluation of Corrective Measures Alternative

Alternative 1 is the application of deed restrictions to prevent future residential use of this area of SWMU 4. These restrictions are legally binding and would be incorporated into the deed created for the transfer of the BRAC parcel from TEAD to the buyer.

Deed restrictions on the BRAC property are governed by the Covenants, Conditions, and Restrictions (CCRs) November 1998. The CCRs dictate that deed restrictions are enforceable by the United States of America, the Redevelopment Agency of Tooele City, and Transferee, or by other designated government agencies. This information is specified in the “Memorandum of Agreement Between the Department of Army, The State of Utah Department of Environmental Quality, and the U.S. Environmental Protection Agency,

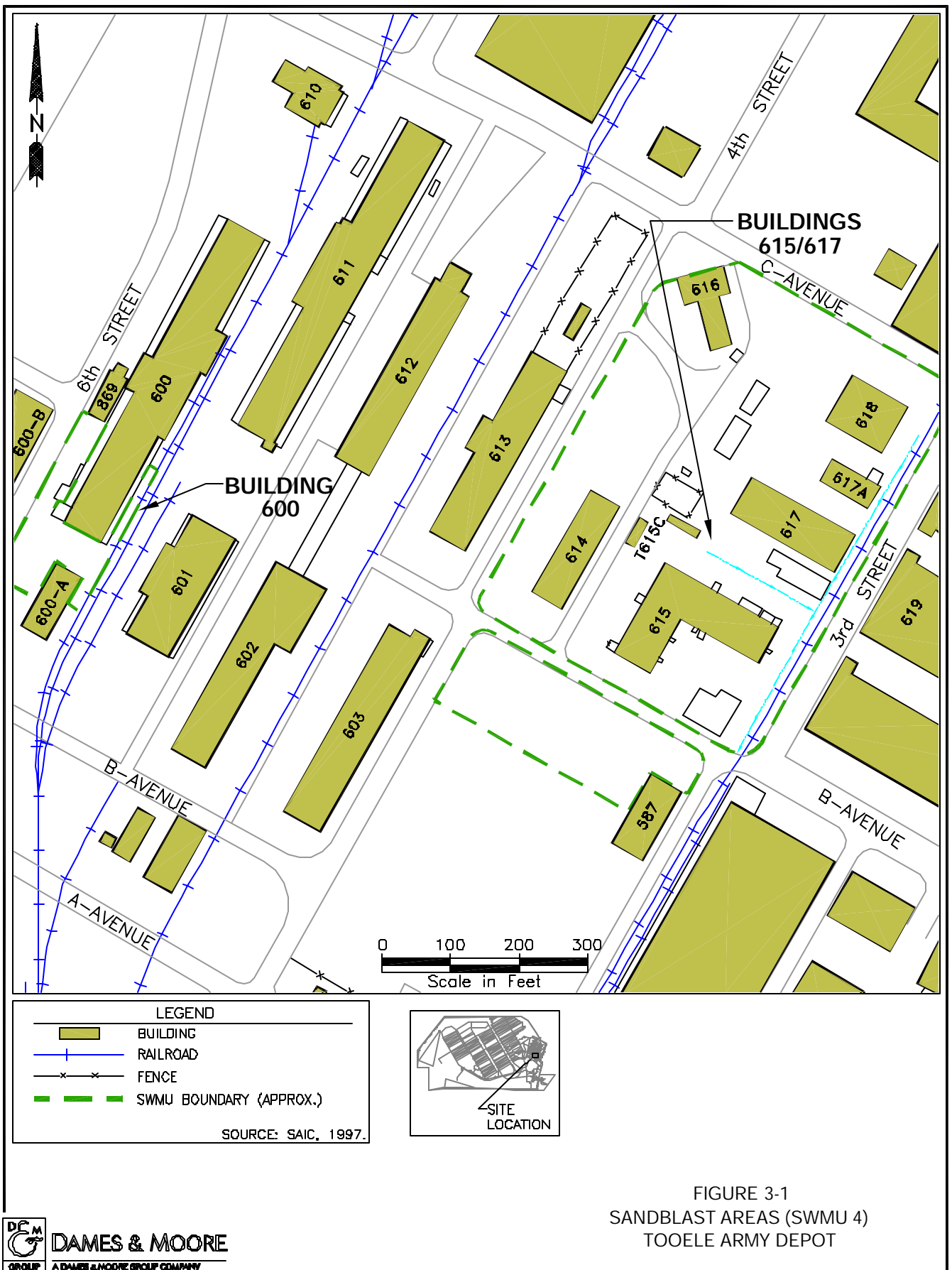


TABLE 3-1

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Sandblast Areas (SWMU 4) - Building 600

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)		
Human Health Risk Assessment (a)						Impacts to Groundwater		Ecological Risk	COCs (b)	Corrective Measures Alternatives (c)	
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: Lead Benzo(a)anthracence	<i>Deed restrictions</i>
			Blood Lead Level (f)				Blood Lead Level (f)				
	Risk	HI			Risk	HI					
Adult	6×10 <sup>-6</sup>	10	NE (g)	Industrial	2×10 <sup>-6</sup>	0.2	NE (g)				
Child	3×10 <sup>-6</sup>	30	NE	Construction	1×10 <sup>-7</sup>	0.06	NE				

- (a) Risks, hazard indices (HIs), and blood lead levels that are above comparison levels appear in bold type.
- (b) Lead and benzo(a)anthracene were detected at concentrations only slightly above CAOs and in only one sample.
- (c) The recommended corrective measures alternative appears in bold italic type.
- (d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario. Because risks and HIs are greater than  $1 \times 10^{-6}$  and 1.0, respectively, EPA guidance and UAC R315-101-6(c)(3) indicate that a CMS must be performed.
- (e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario. Because risks and HIs are less than  $1 \times 10^{-4}$  and 1.0, respectively, UAC R315-101-6(d) indicates that management measures can be evaluated.
- (f) Blood lead levels for industrial and construction workers are expressed as the concentration (micrograms per deciliter ( $\mu\text{g}/\text{dL}$ )) limit for 95 percent of the population. The Centers for Disease Control and Prevention (CDC) defines a limit of 10  $\mu\text{g}/\text{dL}$ . Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10  $\mu\text{g}/\text{dL}$  (should not exceed 5 percent).
- (g) Not evaluated.

Regarding Continuing Environmental Responsibility for Transferred Portions of the Tooele Army Depot” (December 1998).

Deed restrictions on this area of SWMU 4 apply within the SWMU boundary presented on Figure 3-1 and as defined in Exhibit C of the CCRs. Alternative 1 – deed restrictions – is evaluated as follows:

- Technical criteria
  - **Performance** – Because deed restrictions limit future exposure by preventing residential use of Building 600, they meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). Deed restrictions are applicable to both site and contaminant characteristics, and meet the identified goals with no decrease in effectiveness over time.
  - **Reliability** – Deed restrictions are effective over the long term and have been implemented at many sites with positive results. No additional exposure should occur while the restrictions are in place. No management of waste materials, long-term environmental monitoring, or O&M activities are required under this alternative.
  - **Implementability** – Deed restrictions are technically and administratively feasible at Building 600. Because SWMU 4 is part of the BRAC parcel, this alternative requires the placement of legally binding restrictions on the property at the time of transfer from the Army.
  - **Safety** – Because no intrusive activities are required, this alternative poses no potential threats to workers, off-post residential communities, or the environment.
- Human health assessment – Restricting future development of the site protects human health by preventing residential exposure to the previously identified contaminants in soil at Building 600.
- Environmental assessment – Deed restrictions do not affect the ecological environment. Additionally, the SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at Building 600.
- Administrative feasibility – This alternative meets the specified requirements of UAC R315-101 by preventing future residential development in this area of SWMU 4.

- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$5,000. Table A-1 (Appendix A) presents the detailed cost estimate.

### 3.1.3 Recommended Corrective Measures Alternative

Based on the above evaluation, Alternative 1 – deed restrictions – is recommended as the preferred alternative for Building 600 at SWMU 4 because:

- It meets the requirements of UAC R315-101.
- It has been demonstrated at other sites.
- It is reliable and implementable.

## 3.2 BUILDINGS 615/617

### 3.2.1 Summary of RAs and CMS Work Plan

As at Building 600, vehicle maintenance – including painting, stripping, and sandblasting using three types of media (steel grit, ground walnut shells, and glass beads) – was conducted in Buildings 615/617. Wastes included spent sandblast media and paint stripping solutions (including phosphoric acid, hydrochloric acid, and sodium hydroxide).

The Phase II RFI (SAIC, 1997) identified unacceptable risks to human health at Buildings 615/617 under the hypothetical future residential land use scenario. Therefore, according to EPA guidance and UAC R315-101-6(d), this area of SWMU 4 is included in the CMS process, and corrective measures must be evaluated. However, the human health RA identified no unacceptable risks or hazards for the reasonably anticipated future industrial and construction worker scenarios.

No groundwater monitoring was conducted at SWMU 4. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, and depth to groundwater.

The SWERA (Rust E&I, 1997) determined that the contaminants at Buildings 615/617 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition, the Phase II RFI (SAIC, 1997) concluded that the habitat at SWMU 4 and adjacent areas is insufficient to support an animal population.

The CMS Work Plan (Dames & Moore, 2000) identified chromium, lead, benzo(a)anthracene, and benzo(a)pyrene as COCs in surface soil at Buildings 615/617. The EPCs for chromium, lead, and benzo(a)anthracene are well below their CAOs. The EPC for benzo(a)pyrene is approximately four times as high as its corresponding CAO. Because the CAO concentrations correspond to a cancer risk of  $1 \times 10^{-6}$ , the EPCs for benzo(a)pyrene and the other COCs do not result in an unacceptable human health risk.

An evaluation was performed in Appendix F of the CMS Work Plan (Dames & Moore, 2000) to determine if the locations of COCs are surrounded by other contaminant detections below CAOs, or are single isolated detections. The evaluation determined that the COCs at Buildings 615/617 are present only in isolated surface soil samples at low levels and are not a pervasive problem across the site.

The CAOs for Buildings 615/617 are:

- To ensure that – if the identified industrial land use scenario changes in the future to residential or other use – appropriate measures are taken to adequately protect human health and the environment.
- To comply with UAC R315-101 and all its parts.

Based on the evaluation of risks and hazards to human health and the environment, the identified COCs, and regulatory requirements, only management measures are evaluated for Buildings 615/617. The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternative for this area of SWMU 4:

<b>SANDBLAST AREAS (SWMU 4), Buildings 615/617</b>
<b>Alternative 1 – Deed restrictions</b>
Impose deed restrictions to prevent residential development.

Table 3-2 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternative identified for Buildings 615/617 in the CMS Work Plan (Dames & Moore, 2000).

### 3.2.2 Detailed Evaluation of Corrective Measures Alternatives

Alternative 1 is the application of deed restrictions to prevent future residential use of this area of SWMU 4. These restrictions are legally binding and would be incorporated into the deed created for the transfer of the BRAC parcel from TEAD to the buyer.

Deed restrictions on the BRAC property are governed by the CCRs as discussed in Section 3.1.2. Deed restrictions on this area of SWMU 4 apply within the SWMU boundary presented on Figure 3-1 and as defined in Exhibit C of the CCRs. Alternative 1 – deed restrictions – is evaluated as follows:

TABLE 3-2

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Sandblast Areas (SWMU 4) - Buildings 615/617

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)		
Human Health Risk Assessment (a)							Impacts to Groundwater	Ecological Risk	COCs (b)	Corrective Measures Alternatives (c)	
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: Chromium Lead Benzo(a)anthracence Benzo(a)pyrene	<i>Deed restrictions</i>
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)				
Adult	6×10 <sup>-5</sup>	0.3	NE (g)	Industrial	3×10 <sup>-6</sup>	0.1	6				
Child	3×10 <sup>-5</sup>	0.7	15	Construction	7×10 <sup>-8</sup>	0.03	8				

- (a) Risks, HIs, and blood lead levels that are above comparison levels appear in bold type.
- (b) The EPC for each COC is below its respective CAO.
- (c) The recommended corrective measures alternative appears in bold italic type.
- (d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario. Because risks are greater than  $1 \times 10^{-6}$ , EPA guidance and UAC R315-101-6(c)(3) indicate that a CMS must be performed.
- (e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario. Because risks and HIs are less than  $1 \times 10^{-4}$  and 1.0, respectively, UAC R315-101-6(d) indicates that management measures can be evaluated.
- (f) Blood lead levels for industrial and construction workers are expressed as the concentration ( $\mu\text{g/dL}$ ) limit for 95 percent of the population. The CDC defines a limit of 10  $\mu\text{g/dL}$ . Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10  $\mu\text{g/dL}$  (should not exceed 5 percent).
- (g) Not evaluated.



- Technical criteria
  - Performance – Because deed restrictions limit future exposure by preventing residential use of Buildings 615/617, they meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). Deed restrictions are applicable to both site and contaminant characteristics, and meet the identified goals with no decrease in effectiveness over time.
  - Reliability – Deed restrictions are effective over the long term and have been implemented at many sites with positive results. No additional exposure should occur while the restrictions are in place. No management of waste materials, long-term environmental monitoring, or O&M activities are required under this alternative.
  - Implementability – Deed restrictions are technically and administratively feasible at Buildings 615/617. Because SWMU 4 is part of the BRAC parcel, this alternative requires the placement of legally binding restrictions on the property at the time of transfer from the Army.
  - Safety – Because no intrusive activities are required, this alternative poses no potential threats to workers, off-post residential communities, or the environment.
- Human health assessment – Restricting future development of the site protects human health by preventing residential exposure to the previously identified contaminants in soil at Buildings 615/617.
- Environmental assessment – Deed restrictions do not affect the ecological environment. Additionally, the SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at Buildings 615/617.
- Administrative feasibility – This alternative meets the specified requirements of UAC R315-101 by preventing future residential development in this area of SWMU 4.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$5,000. Table A-2 (Appendix A) presents the detailed cost estimate.

### 3.2.3 Recommended Corrective Measures Alternative

Based on the above evaluation, Alternative 1 – deed restrictions – is recommended as the preferred alternative for Buildings 615/617 at SWMU 4 because:

- It meets the requirements of UAC R315-101.
- It has been demonstrated at other sites.
- It is reliable and implementable.

## **4.0 AED DEMILITARIZATION TEST FACILITY (SWMU 19)**

Section 4.0 evaluates corrective measures alternatives for the AED Demilitarization Facility (SWMU 19; Figure 4-1). Data From the CMS Work Plan (Dames & Moore, 2000), the human health RA (SAIC, 1997), and the SWERA (Rust E&I, 1997) are also summarized below. SWMU 19 is not located in the BRAC parcel and continues to be used by the Depot.

### **4.1 SUMMARY OF RAs AND CMS WORK PLAN**

The AED Demilitarization Test Facility is located southwest of the Ordnance Area, in a remote and undeveloped area of TEAD (SAIC, 1997). It was constructed in 1973 to pilot test new demilitarization equipment and operational procedures.

The Phase II RFI (SAIC, 1997) identified unacceptable risks to human health at SWMU 19 under the hypothetical future residential land use scenario. Therefore, according to EPA guidance and UAC R315-101-6(d), this SWMU is included in the CMS process, and corrective measures must be evaluated. However, the human health RA identified no unacceptable risks or hazards for the reasonably anticipated future military and construction worker scenarios.

No groundwater monitoring was conducted at SWMU 19. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater (approximately 630 feet bgs).

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 19 pose a low ecological risk and recommended no corrective measures to reduce risk.

No COCs were identified at the AED Demilitarization Test Facility.

The CAOs for SWMU 19 are:

- To ensure that – if the current military land use scenario changes in the future to residential or other use – appropriate measures are taken to adequately protect human health and the environment.
- To comply with UAC R315-101 and all its parts.

Based on the evaluation of risks and hazards to human health and the environment and regulatory requirements, only management measures are evaluated for SWMU 19. The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternative for the AED Demilitarization Test Facility:

<b>AED DEMILITARIZATION TEST FACILITY (SWMU 19)</b>
<b>Alternative 1 – Land use restrictions</b>
Impose land use restrictions to prevent residential development.

Table 4-1 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternative identified for SWMU 19.

#### 4.2 DETAILED EVALUATION OF CORRECTIVE MEASURES ALTERNATIVE

Alternative 1 is the application of land use restrictions to prevent future residential use of SWMU 19. Land use restrictions limit the future use of a site that remains under Army control. These restrictions may be used to prevent future residential use of the property. Land use restrictions will be incorporated into TEAD's Installation Master Plan. The Real Property Planning Board has authority over land use at the base and is responsible for developing, enforcing, and modifying the Master Plan. The authority of the board is derived from the responsible major Army command (i.e., Industrial Operations Command). The overall purpose of the Master Plan is to describe and analyze existing facilities, conditions, and future requirements, as well as to provide guidelines for orderly growth and development of the installation. The Master Plan consolidates interrelated programs and information into a framework for logically determining installation requirements associated with current and future assigned missions and activities. It is the mechanism for ensuring that installation projects are sited to meet operational, safety, and environmental requirements.

Environmental protection (site management) plans will be attached as secondary components to the Master Plan. These plans are used to identify land use restrictions, as well as maintenance and monitoring requirements for other institutional controls (e.g., fencing) that may be implemented. They include legal descriptions and maps identifying the location of each site where land use restrictions or other institutional controls will be applied.

In addition to site management, for those sites under the RCRA corrective action program, conditions will be added to the Post Closure Permit to document restrictions as well as monitoring, maintenance, and inspection requirements.

In all cases, procedures are in place to ensure that an environmental evaluation is conducted prior to executing the action, and that all constraints or limitations are identified and documented. Although mechanisms for conducting such evaluations vary depending on the action, the result is that the proponent of the action must comply with all applicable restrictions or limitations.

Because U.S. Army regulations direct that all revisions to the Installation Master Plan be evaluated with regard to potential impacts to human health and the environment,

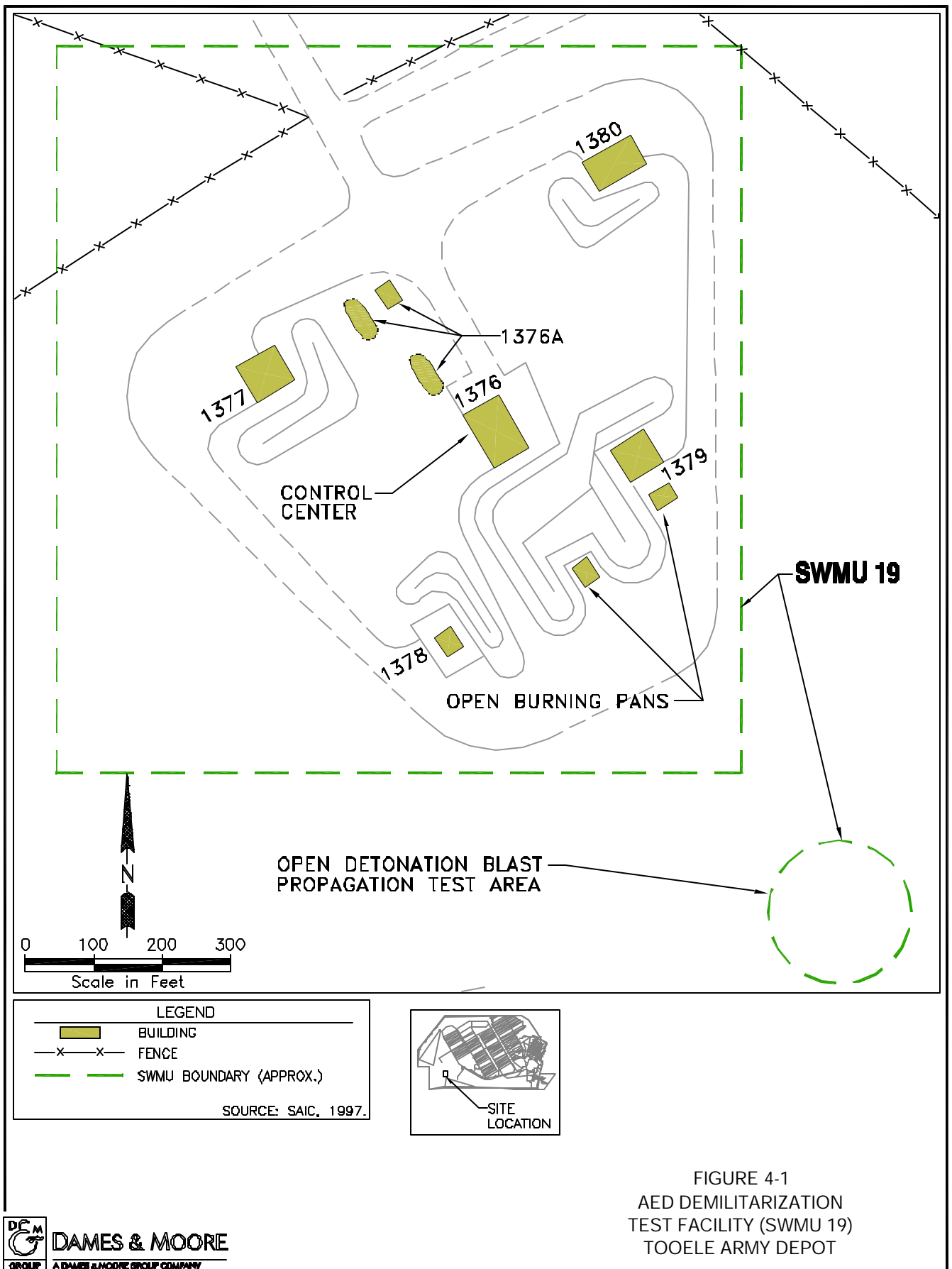


TABLE 4-1

Summary of Phase II RFI, SWERA, and CMS Work Plan  
AED Demilitarization Test Facility (SWMU 19)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)		
Human Health Risk Assessment (a)							Impacts to Groundwater	Ecological Risk	COCs	Corrective Measures Alternatives (b)	
Hypothetical Future Residential Land Use Scenario (c)				Realistic Future Land Use Scenario (d)				None	Low	None	<i>Land use restrictions</i>
	Risk	HI	Blood Lead Level (e)		Risk	HI	Blood Lead Level (e)				
Adult	9×10 <sup>-4</sup>	6	NE(f)	Industrial	4×10 <sup>-7</sup>	0.005	NE				
Child	5×10 <sup>-4</sup>	20	NE	Construction	NE	NE	NE				

(a) Risks, HIs, and blood lead levels that are above comparison levels appear in bold type.

(b) The recommended corrective measures alternative appears in bold italic type.

(c) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario. Because risks and HIs are greater than  $1 \times 10^{-6}$  and 1.0, respectively, EPA guidance and UAC R315-101-6(c)(3) indicate that a CMS must be performed.

(d) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario. Because risks and HIs are less than  $1 \times 10^{-4}$  and 1.0, respectively, UAC R315-101-6(d) indicates that management measures can be evaluated.

(e) Blood lead levels for industrial and construction workers are expressed as the concentration ( $\mu\text{g/dL}$ ) limit for 95 percent of the population. The CDC defines a limit of 10  $\mu\text{g/dL}$ . Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10  $\mu\text{g/dL}$  (should not exceed 5 percent).

(f) Not evaluated.

authorization for another use for SWMU 19 would require a reevaluation of corrective measures to ensure protection of human health and the environment under the new land use.

Alternative 1 – land use restrictions – is evaluated as follows:

- Technical criteria
  - Performance – Land use restrictions limit future exposure to the site by preventing the residential use of SWMU 19 and also meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). This corrective measures alternative is applicable to both site and contaminant characteristics, and meets the identified goals with no decrease in effectiveness over time.
  - Reliability – Land use restrictions are effective over the long term and have been implemented at many sites with positive results. No additional exposure should occur while the restrictions are in place. No management of waste materials, long-term environmental monitoring, or O&M activities are required under this alternative.
  - Implementability – Land use restrictions are technically and administratively feasible at SWMU 19. Because this site is currently under military use, continuing restrictions should not be difficult. This corrective measures alternative meets the CAOs.
  - Safety – Because no intrusive activities are required, this alternative poses no potential threats to workers, off-post residential communities, or the environment.
- Human health assessment – Restricting future development of the site protects human health by preventing residential exposure to the previously identified contaminants in soil at SWMU 19.
- Environmental assessment – Land use restrictions do not affect the ecological environment. Additionally, the SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at SWMU 19.
- Administrative feasibility – This alternative meets the specified requirements of UAC R315-101 by preventing future residential development at this site.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$5,000. Table A-3 (Appendix A) presents the detailed cost estimate.

#### 4.3 RECOMMENDED CORRECTIVE MEASURES ALTERNATIVE

Based on the above evaluation, Alternative 1 – land use restrictions – is recommended as the preferred alternative for SWMU 19 because:

- It meets the requirements of UAC R315-101.
- It has been demonstrated at other sites.
- It is reliable and implementable.



## **5.0 DRMO STORAGE YARD (SWMU 26)**

Section 5.0 evaluates corrective measures alternatives for the DRMO Storage Yard (SWMU 26; Figure 5-1). Data from the CMS Work Plan (Dames & Moore, 2000), the human health RA (SAIC, 1997), and the SWERA (Rust E&I, 1997) are also summarized below. SWMU 26 is located within the BRAC parcel.

### **5.1 SUMMARY OF RAs AND CMS WORK PLAN**

The DRMO Storage Yard is a 66-acre area that was used for the temporary storage of surplus military material, including small quantities of hazardous materials (SAIC, 1997). It is located in the eastern section of the Maintenance Area. The site is flat and unpaved, with fencing around the perimeter. Several corrugated steel buildings are located in the storage yard.

The Phase II RFI (SAIC, 1997) identified unacceptable risks to human health at the DRMO Storage Yard under the hypothetical future residential land use scenario. Therefore, according to EPA guidance and UAC R315-101-6(d), this SWMU is included in the CMS process, and corrective measures must be evaluated. However, the human health RA identified no unacceptable risks or hazards for the reasonably anticipated future industrial and construction worker scenarios.

Blood lead levels for the construction worker scenario exceed the CDC guideline of 10 µg/L. (Levels for the industrial worker scenario do not exceed the guideline.) However, the model used to estimate blood lead concentrations associated with adult exposure to lead in soil is not applicable if the exposure is less than 90 days (USEPA, 1996). Because the exposure frequency assumed in the human health RA for construction workers is 50 days/year (days/yr), the model results are suspect and the blood lead levels are overestimated.

No groundwater monitoring was conducted at SWMU 26. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater (approximately 370 feet bgs).

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 26 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition to the SWERA, the Phase II RFI Report (SAIC, 1997) concluded that there is no ecological risk to individual organisms, small populations of organisms, habitats, or ecosystems at SWMU 26.

The CMS Work Plan (Dames & Moore, 2000) identified benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene as COCs in surface soil at SWMU 26. The EPCs for benzo(a)anthracene and benzo(b)fluoranthene are lower than and slightly higher than their CAOs, respectively. The EPC for benzo(a)pyrene is approximately a factor of 11 greater than

its CAO. Because the CAO concentrations correspond to a cancer risk of  $1 \times 10^{-6}$ , the EPCs for the COCs do not result in an unacceptable human health risk (i.e., the risk is below  $1 \times 10^{-4}$ ).

An evaluation was performed in Appendix F in the CMS Work Plan (Dames & Moore, 2000) to determine if the locations of COCs are surrounded by other contaminant detections below CAOs, or are single isolated detections. The evaluation determined that the COCs at SWMU 26 are present only in one isolated surface soil sample at low levels and are not a pervasive problem across the site.

The CAOs at SWMU 26 are:

- To ensure that – if the identified industrial land use scenario changes in the future to residential or other use – appropriate measures are taken to adequately protect human health and the environment.
- To comply with UAC R315-101 and all its parts.

Based on the evaluation of risks and hazards to human health and the environment, the identified COCs, and regulatory requirements, only management measures are evaluated for SWMU 26. The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternative for the DRMO Storage Yard:

<b>DRMO STORAGE YARD (SWMU 26)</b>
<b>Alternative 1 – Deed restrictions</b>
Impose deed restrictions to prevent residential development.

Table 5-1 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust, 1997), and lists the corrective measures alternative identified for SWMU 26 in the CMS Work Plan (Dames & Moore, 2000).

## **5.2 DETAILED EVALUATION OF CORRECTIVE MEASURES ALTERNATIVE**

Alternative 1 is the application of deed restrictions to prevent future residential use of SWMU 26. These restrictions are legally binding and would be incorporated into the deed created for the transfer of the BRAC parcel from TEAD to the buyer. Deed restrictions on the BRAC property are governed by the CCRs as discussed in Section 3.1.2. Deed restrictions on SWMU 26 apply within the SWMU boundary presented on Figure 5-1 and as defined in Exhibit C of the CCRs. Alternative 1 – deed restrictions – is evaluated as follows:

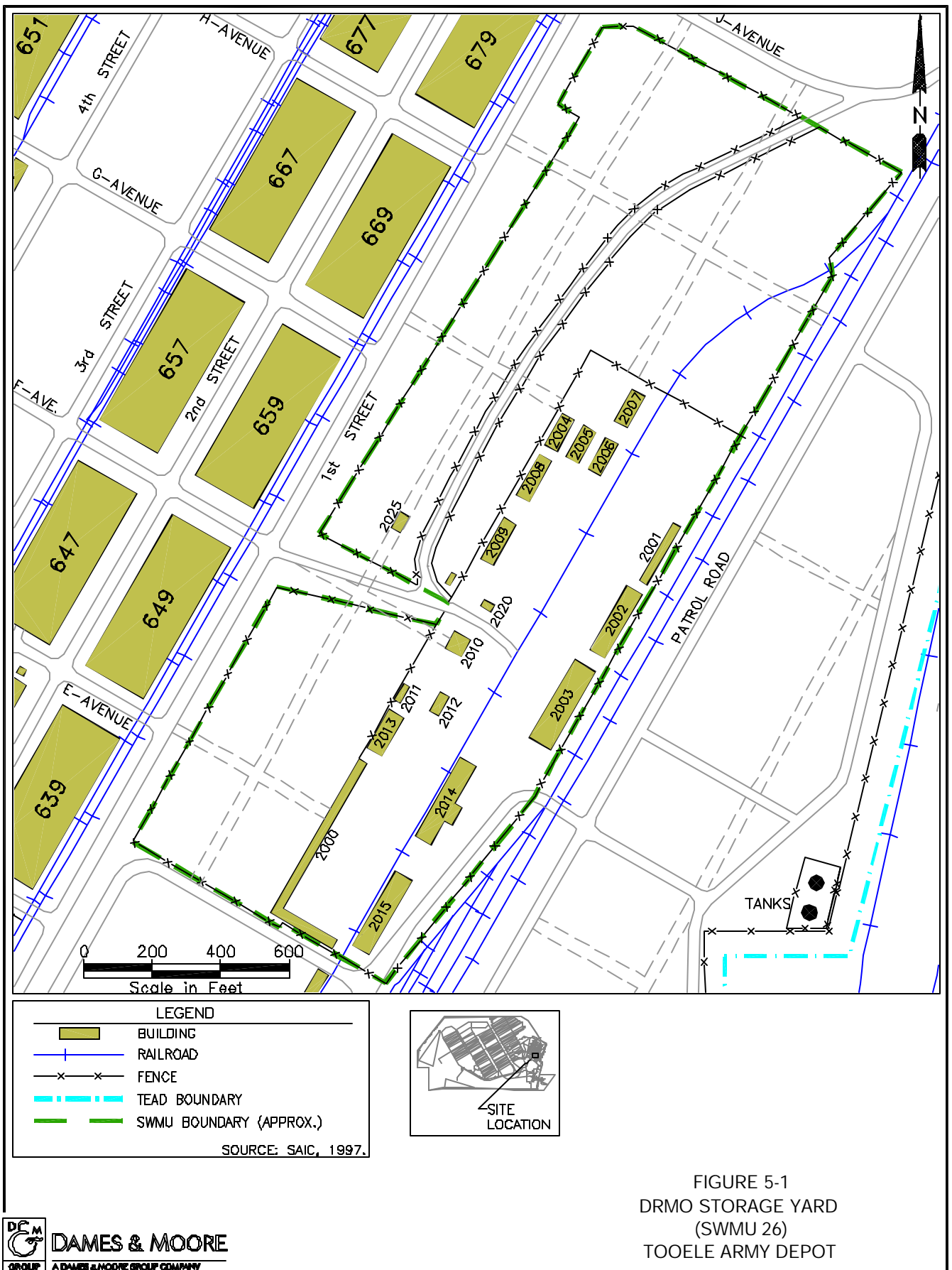


TABLE 5-1

Summary of Phase II RFI, SWERA, and CMS Work Plan  
DRMO Storage Yard (SWMU 26)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)		
Human Health Risk Assessment (a)							Impacts to Groundwater	Ecological Risk	COCs (b)	Corrective Measures Alternatives (c)	
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene	<i>Deed restrictions</i>
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)				
Adult	2×10 <sup>-4</sup>	20	NE (g)	Industrial	6×10 <sup>-6</sup>	0.8	8				
Child	1×10 <sup>-4</sup>	60	45	Construction	1×10 <sup>-6</sup>	0.2	13				

- (a) Risks, HIs, and blood lead levels that are above comparison levels appear in bold type.
- (b) Each COC was detected above its respective CAO in one sample only.
- (c) The recommended corrective measures alternative appears in bold italic type.
- (d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario. Because risks and HIs are greater than  $1 \times 10^{-6}$  and 1.0, respectively, EPA guidance and UAC R315-101-6(c)(3) indicate that a CMS must be performed.
- (e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario. Because risks and HIs are less than  $1 \times 10^{-4}$  and 1.0, respectively, UAC R315-101-6(d) indicates that management measures can be evaluated.
- (f) Blood lead levels for industrial and construction workers are expressed as the concentration ( $\mu\text{g}/\text{dL}$ ) limit for 95 percent of the population. The CDC defines a limit of 10  $\mu\text{g}/\text{dL}$ . Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10  $\mu\text{g}/\text{dL}$  (should not exceed 5 percent).
- (g) Not evaluated.

- Technical criteria
  - Performance – Because deed restrictions limit future exposure by preventing residential use of SWMU 26, they meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). Deed restrictions are applicable to both site and contaminant characteristics, and meet the identified goals with no decrease in effectiveness over time.
  - Reliability – Deed restrictions are effective over the long term and have been implemented at many sites with positive results. No additional exposure should occur while the restrictions are in place. No management of waste materials, long-term environmental monitoring, or O&M activities are required under this alternative.
  - Implementability – Deed restrictions are technically and administratively feasible at the DRMO Storage Yard. Because SWMU 26 is part of the BRAC parcel, this alternative requires the placement of legally binding restrictions on the property at the time of transfer from the Army.
  - Safety – Because no intrusive activities are required, this alternative poses no potential threats to workers, off-post residential communities, or the environment.
- Human health assessment – Restricting future development of the site protects human health by preventing residential exposure to the previously identified contaminants in soil at SWMU 26.
- Environmental assessment – Deed restrictions do not affect the ecological environment. Additionally, the SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at SWMU 26.
- Administrative feasibility – This alternative meets the specified requirements of UAC R315-101 by preventing future residential development at this site.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$5,000. Table A-4 (Appendix A) presents the detailed cost estimate.

### 5.3 RECOMMENDED CORRECTIVE MEASURES ALTERNATIVE

Based on the above evaluation, Alternative 1 – deed restrictions – is recommended as the preferred alternative for SWMU 26 because:

- It meets the requirements of UAC R315-101.
- It has been demonstrated at other sites.
- It is reliable and implementable.

## **6.0 DRUM STORAGE AREA (SWMU 29)**

Section 6.0 evaluates corrective measures alternatives for the Drum Storage Area (SWMU 29; Figure 6-1). Data from the CMS Work Plan (Dames & Moore, 2000), the human health RA (SAIC, 1997), and the SWERA (Rust E&I, 1997) are also summarized below. SWMU 29 is located within the BRAC parcel.

### **6.1 SUMMARY OF RAs AND CMS WORK PLAN**

The Drum Storage Area was used to store empty drums before they were returned to the originating contractor (SAIC, 1997). Solvents, degreasers, and oils may have been released from the drums because they were reportedly stored upside down to allow residual material to drain. The Drum Storage Area is located near the southern end of the Maintenance Area. The northern part of the SWMU is a triangular-shaped open area of approximately 5 acres. The southern part is a 25-acre area covered by gravel and broken asphalt. Buildings 576 and 589 are located within a fenced enclosure, and Building 591 is located along the eastern edge of the southern part of the SWMU.

The Phase II RFI (SAIC, 1997) identified unacceptable risks to human health at the Drum Storage Area under the hypothetical future residential land use scenario. Therefore, according to EPA guidance and UAC R315-101-6(d), this SWMU is included in the CMS process, and corrective measures must be evaluated. However, the human health RA identified no unacceptable risks or hazards for the reasonably anticipated future industrial and construction worker scenarios.

Three groundwater monitoring wells were installed during the Phase II RFI (SAIC, 1997). During this investigation, metals, one volatile organic compound (VOC), and one semivolatile organic compound (SVOC) were identified as COPCs in groundwater.

The well in which the VOC (trichloroethylene) was detected is located approximately 700 feet downgradient of IWL outfall ditch B (SWMU 2, Known Releases), which is a known source of trichloroethylene (SAIC, 1997). The metals in groundwater may have resulted from well construction, contamination from IWL outfall ditch B, or contamination from the sanitary landfill (SWMU 12/15, Known Releases) located to the west (and upgradient of the monitoring wells); they do not appear to be related to contamination at the Drum Storage Area. The VOC, SVOC, and metals detected in groundwater downgradient of the site appear to be unrelated to constituents in the soil at SWMU 29. Based on all available data, the origin of groundwater contaminants is more likely to be the IWL or the landfill. Groundwater and vadose zone contamination at all potential source areas in the Maintenance Area is being separately addressed as SWMU 58. However, according to the Phase II RFI (SAIC, 1997), the constituents at SWMU 29 are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater (approximately 300 ft bgs).

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 29 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition to the SWERA, the Phase II RFI Report (SAIC, 1997) concluded that the habitat at SWMU 29 and in adjacent areas is insufficient to support an animal population.

The CMS Work Plan (Dames & Moore, 2000) identified benzo(a)pyrene in surface soil as the only COC at SWMU 29. The EPC for benzo(a)pyrene is approximately twice its CAO. The CAO concentration corresponds to a cancer risk of  $1 \times 10^{-6}$  and does not result in an unacceptable human health risk.

An evaluation was performed in Appendix F of the CMS Work Plan (Dames & Moore, 2000) to determine if the one location of benzo(a)pyrene above its industrial CAO is surrounded by other contaminant detections below CAOs, or is a single isolated detection. The evaluation determined that the COC at SWMU 29 is present only in one isolated surface soil sample at a low level and is not a pervasive problem across the site.

The CAOs at SWMU 29 are:

- To ensure that – if the identified industrial land use scenario changes in the future to residential or other use – appropriate measures are taken to adequately protect human health and the environment.
- To comply with UAC R315-101 and all its parts.

Based on the evaluation of risks and hazards to human health and the environment, the identified COC, and regulatory requirements, only management measures are evaluated for SWMU 29. The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternative for the Drum Storage Area:

<b>DRUM STORAGE AREA (SWMU 29)</b>
<b>Alternative 1 – Deed restrictions</b>
Impose deed restrictions to prevent residential development.

Table 6-1 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternative identified for SWMU 29 in the CMS Work Plan (Dames & Moore, 2000).

## 6.2 DETAILED EVALUATION OF CORRECTIVE MEASURES ALTERNATIVE

Alternative 1 is the application of deed restrictions to prevent future residential use of SWMU 29. These restrictions are legally binding and would be incorporated into the deed created for the transfer of the BRAC parcel from TEAD to the buyer. Deed restrictions on the BRAC property are governed by the CCRs as discussed in Section 3.1.2. Deed



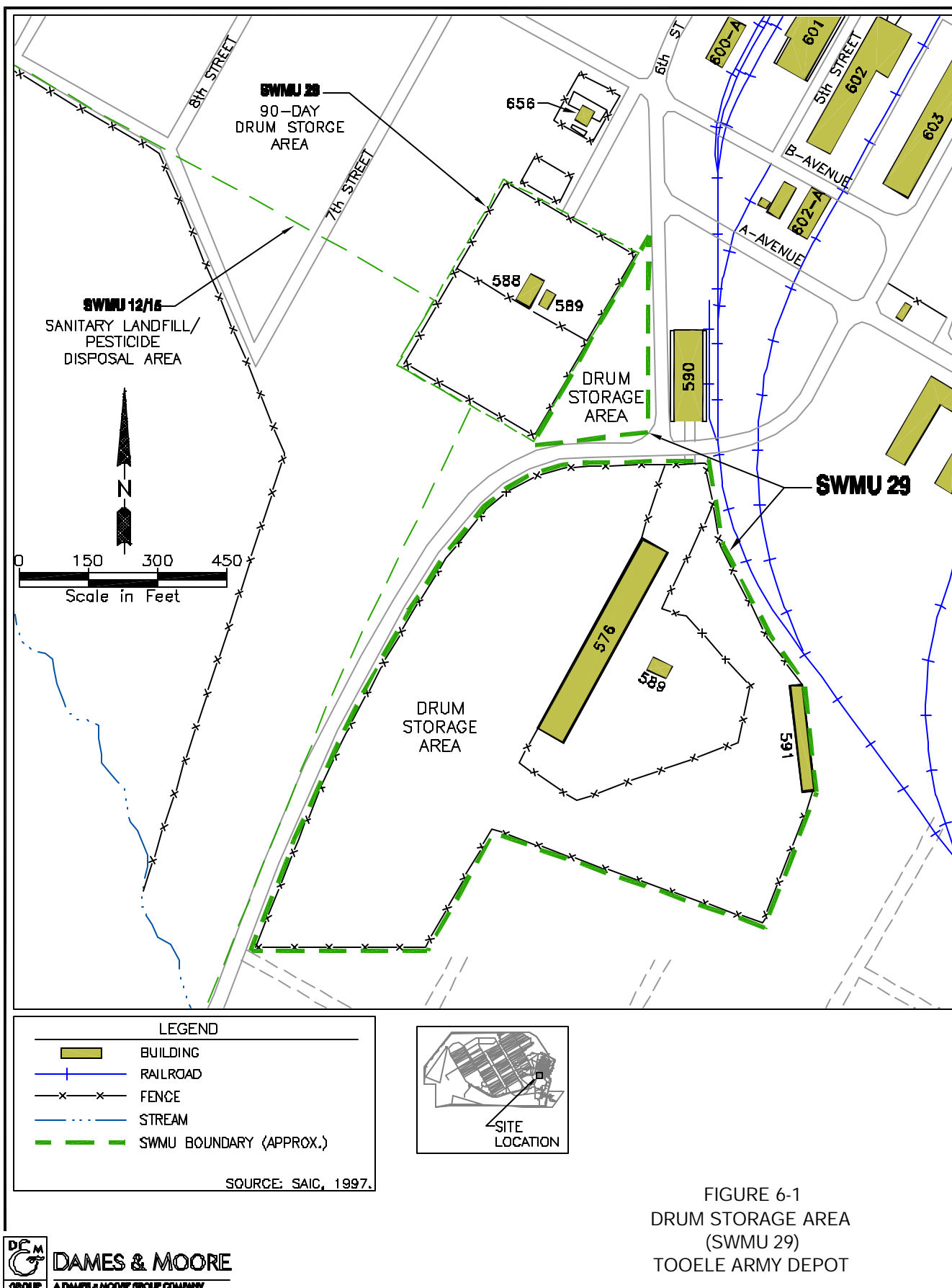


TABLE 6-1

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Drum Storage Area (SWMU 29)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)	
Human Health Risk Assessment (a)								Impacts to Groundwater	Ecological Risk	Corrective Measures Alternatives (c)
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				Yes (h)	Low	Surface soil: Benzo(a)pyrene
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)			
Adult	<b><math>2 \times 10^{-5}</math></b>	<b>20</b>	NE (g)	Industrial	$1 \times 10^{-6}$	0.3	NE			
Child	<b><math>2 \times 10^{-5}</math></b>	<b>50</b>	NE	Construction	$1 \times 10^{-6}$	0.09	NE			<i>Deed restrictions</i>

(a) Risks, HIs, and blood lead levels that are above comparison levels appear in bold type.

(b) Benzo(a)pyrene was detected above its CAO in one sample only.

(c) The recommended corrective measures alternative appears in bold italic type.

(d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario. Because risks and HIs are greater than  $1 \times 10^{-6}$  and 1.0, respectively, EPA guidance and UAC R315-101-6(c)(3) indicate that a CMS must be performed.

(e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario. Because risks and HIs are less than  $1 \times 10^{-4}$  and 1.0, respectively, UAC R315-101-6(d) indicates that management measures can be evaluated.

(f) Blood lead levels for industrial and construction workers are expressed as the concentration ( $\mu\text{g/dL}$ ) limit for 95 percent of the population. The CDC defines a limit of 10  $\mu\text{g/dL}$ . Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10  $\mu\text{g/dL}$  (should not exceed 5 percent).

(g) Not evaluated.

(h) As explained in Section 6.2, the origin of groundwater contaminants at SWMU 29 is likely the IWL (SWMU 2) or the sanitary landfill (SWMU 12/15) located to the west. Groundwater and vadose zone contamination from all potential sources in the Maintenance Area is being separately addressed as SWMU 58.

restrictions on SWMU 29 apply within the SWMU boundary presented on Figure 6-1 and as defined in Exhibit C of the CCRs. Alternative 1 – deed restrictions – is evaluated as follows:

- Technical criteria
  - Performance – Because deed restrictions limit future exposure by preventing residential use of SWMU 29, they meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). Deed restrictions are applicable to both site and contaminant characteristics, and meet the identified goals with no decrease in effectiveness over time.
  - Reliability – Deed restrictions are effective over the long term and have been implemented at many sites with positive results. No additional exposure should occur while the restrictions are in place. No management of waste materials, long-term environmental monitoring, or O&M activities are required under this alternative.
  - Implementability – Deed restrictions are technically and administratively feasible at SWMU 29. Because this site is part of the BRAC parcel, this alternative requires the placement of legally binding restrictions on the property at the time of transfer from the Army. This corrective measures alternative meets the CAOs.
  - Safety – Because no intrusive activities are required, this alternative poses no potential threats to workers, off-post residential communities, or the environment.
- Human health assessment – Restricting future development of the site protects human health by preventing residential exposure to the previously identified contaminants in soil at SWMU 29.
- Environmental assessment – Deed restrictions do not affect the ecological environment. Additionally, the SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at SWMU 29.
- Administrative feasibility – This alternative meets the specified requirements of UAC R315-101 by preventing future residential development at this site.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$5,000. Table A-5 (Appendix A) presents the detailed cost estimate.

### 6.3 RECOMMENDED CORRECTIVE MEASURES ALTERNATIVE

Based on the above evaluation, Alternative 1 – deed restrictions – is recommended as the preferred alternative for SWMU 29, because:

- It meets the requirements of UAC R315-101.
- It has been demonstrated at other sites.
- It is reliable and implementable.

## 7.0 USED OIL DUMPSTERS (SWMU 46)

Section 7.0 evaluates corrective measures alternatives for the Used Oil Dumpsters (SWMU 46; Buildings 522 (south end), 602 (southwest corner), 611 (northwest corner), 619 (south alley); Figures 7-1 and 7-2). Data from the CMS Work Plan (Dames & Moore, 2000), the human health RA (SAIC, 1997), and the SWERA (Rust E&I, 1997) are also summarized below. Building 522 is located within the Administration Area and is scheduled for continued military use; it is not located in the BRAC parcel. Buildings 602, 611, and 619 are located within the Maintenance Area and are included in the BRAC parcel.

The dumpsters are evaluated in accordance with *Guidelines for Utah's Tier 1 Risk-Based Corrective Action: Guide for Screening Petroleum-Contaminated Sites*, which was prepared by the Leaking Underground Storage Tank Program (UDEQ, 1997). Although the dumpsters are not underground tanks, their petroleum-related contaminants are described in the guidelines. Because TPHCs lack toxicity data or separate Utah soil cleanup standards, the levels calculated in the guidelines are adopted as cleanup goals at the Used Oil Dumpsters.

### 7.1 BUILDING 522 (SOUTH END)

#### 7.1.1 Summary of RAs and CMS Work Plan

Building 522 (south end) occupies a 0.2-acre area and is a former collection site where used oil from vehicle maintenance operations was stored in two dumpsters. The dumpsters were routinely emptied by a recycling contractor, and the oil was taken offsite for disposal. Maximum TPHC concentrations in surface soil exceeded the 10,000 microgram per gram ( $\mu\text{g/g}$ ) screening level identified in State guidelines for screening petroleum-contaminated sites (UDEQ, 1997). TPHCs were detected at concentrations ranging from 130 to 12,200  $\mu\text{g/g}$ .

The Phase II RFI (SAIC, 1997) identified no unacceptable risks to human health at Building 522 (south end) under the hypothetical future residential or reasonably anticipated future industrial or construction worker land use scenarios.

No groundwater monitoring was conducted at SWMU 46. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater (approximately 300 to 370 feet bgs).

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 46 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition, the Phase II RFI (SAIC, 1997) concluded that there are no expected ecological receptors and no ecological habitat.

The CMS Work Plan (Dames & Moore, 2000) identified TPHCs as a COC in surface soil at Building 522 (south end). The maximum TPHC concentration (12,200  $\mu\text{g/g}$ ) exceeds

the State of Utah screening level of 10,000 µg/g (UDEQ, 1997) in one sample from a 6-inch depth.

The CAOs at Building 522 (south end) are:

- To comply with UAC R315-101 and all its parts.
- To protect other media from further degradation (i.e., to ensure that contamination does not increase beyond existing levels per UAC R315-101-3).
- To meet the requirements of *Guidelines for Utah's Tier 1 Risk-Based Corrective Action* for petroleum-contaminated sites (UDEQ, 1997).

Based on the evaluation of risks and hazards to human health and the environment, the identified COC, and regulatory requirements, active corrective measures are evaluated for Building 522 (south end). The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternatives for this area of SWMU 46:

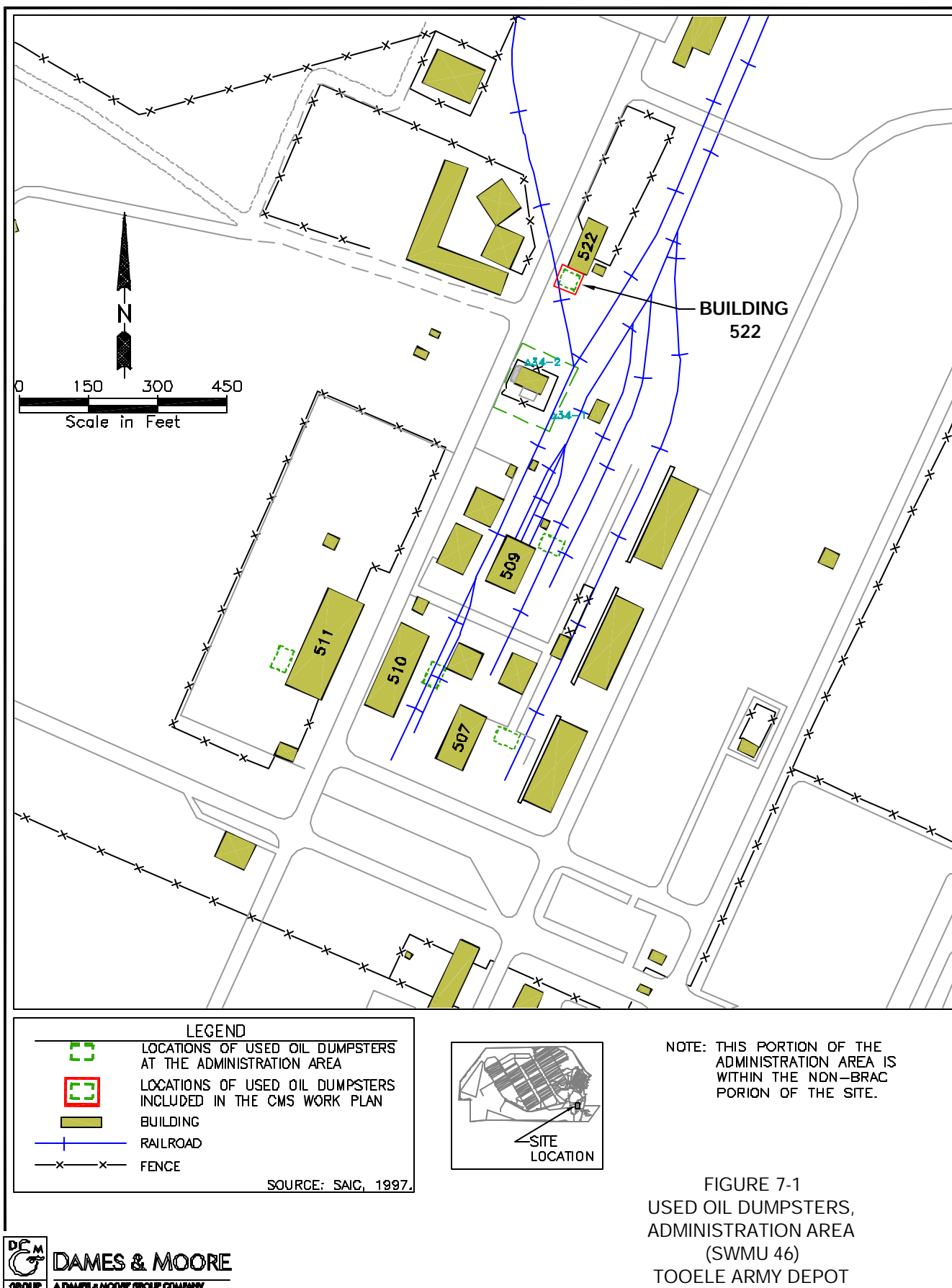
<b>USED OIL DUMPSTERS (SWMU 46), Building 522 (South End)</b>
<b>Alternative 1: Monitored natural attenuation</b>
Monitor TPHC concentrations in soil to document natural attenuation.
<b>Alternative 2: Excavation and off-post treatment/disposal</b>
Excavate and treat/dispose of TPHC-contaminated soil off post.

Figure 7-3 shows the approximate area of contaminated soil. Because the contamination may be localized around the sample location where the screening level CAO was exceeded, it is likely that the estimated volume of contamination is biased high. Assuming that the estimated area of potential contamination is 100 square feet (ft<sup>2</sup>), to a depth of 1.0 foot, the estimated volume of contamination is 4 cubic yards (yd<sup>3</sup>).

Table 7-1 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternatives identified for Building 522 (south end) in the CMS Work Plan (Dames & Moore, 2000).

#### 7.1.2 Detailed Evaluation of Corrective Measures Alternatives

7.1.2.1 Alternative 1 – Monitored Natural Attenuation. Alternative 1 includes quarterly monitoring and documenting the natural attenuation of TPHCs in surface soil at Building 522



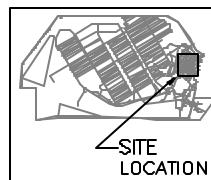
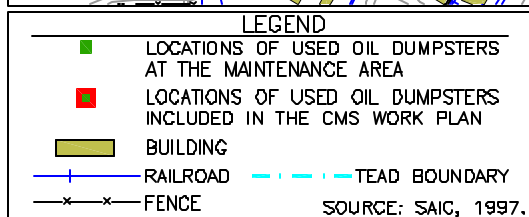
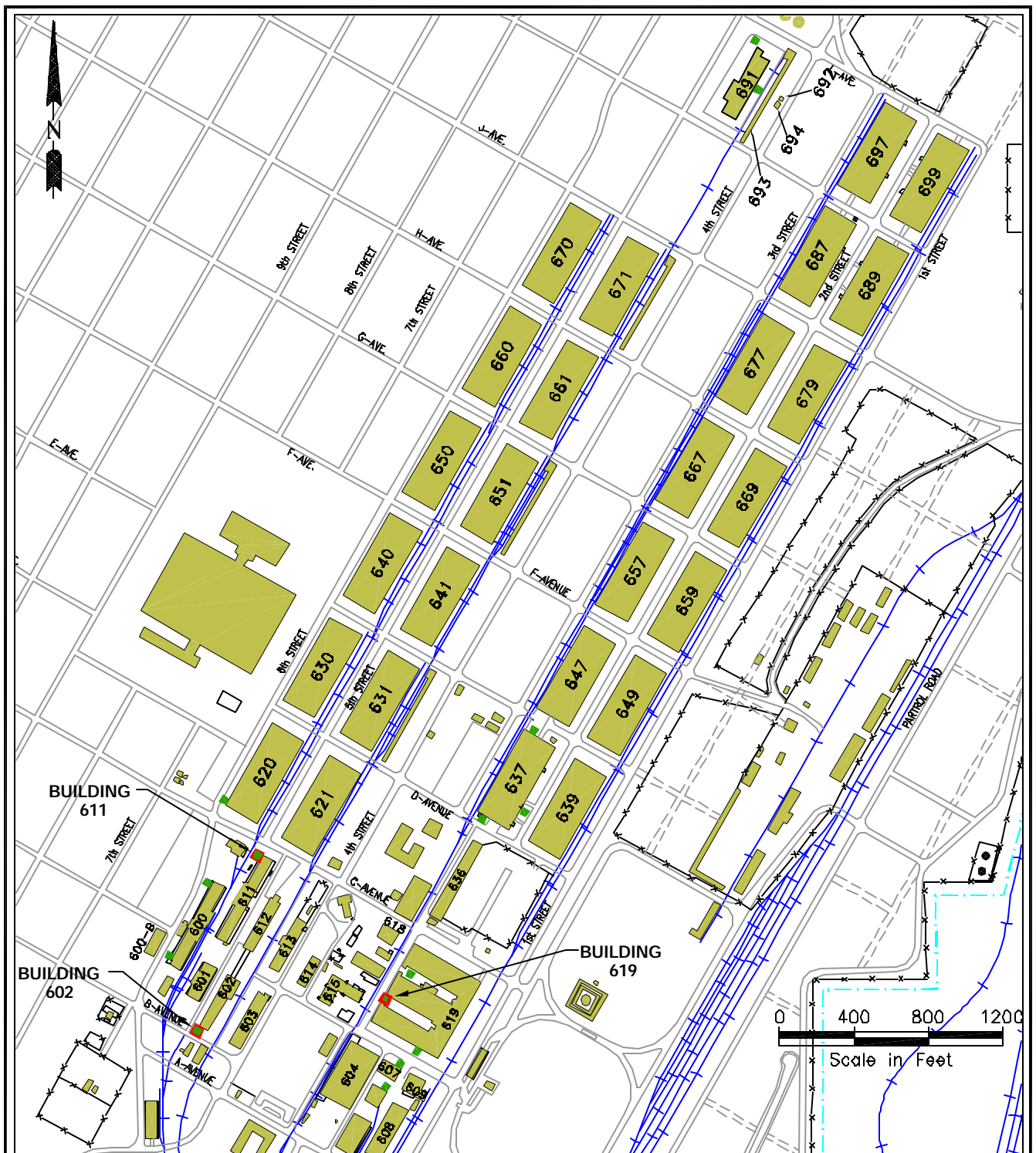


FIGURE 7-2  
USED OIL DUMPSTERS,  
MAINTENANCE AREA  
(SWMU 46)  
TOOELE ARMY DEPOT



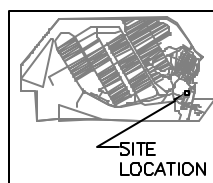
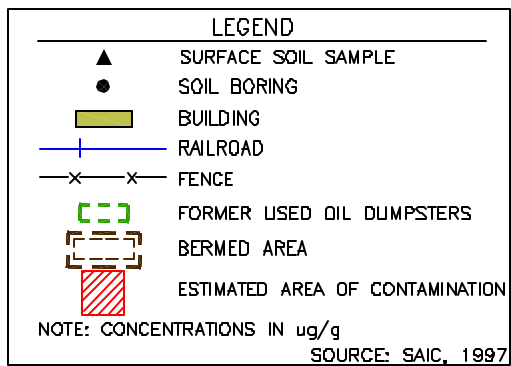
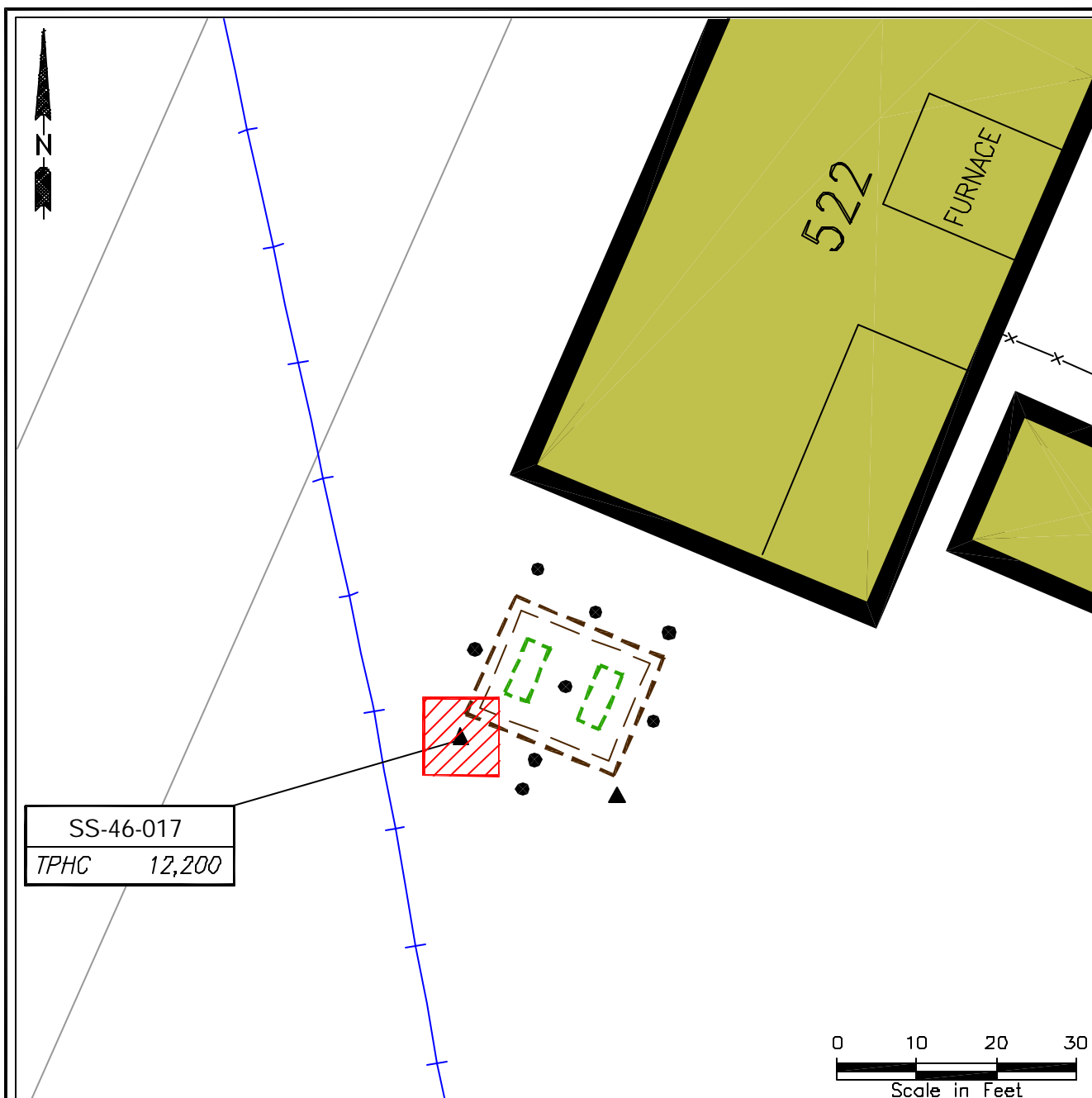


FIGURE 7-3  
ESTIMATED AREA OF EXCAVATION  
BUILDING 522 (SWMU 46)  
TOOELE ARMY DEPOT

TABLE 7-1

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Used Oil Dumpsters (SWMU 46) – Building 522 (South End)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)		
Human Health Risk Assessment (a)						Impacts to Groundwater		Ecological Risk	COCs (b)	Corrective Measures Alternatives (c)	
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: TPHCs	Monitored natural attenuation <i>Excavation and off-post treatment/disposal</i>
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)				
Adult	0	2×10 <sup>-3</sup>	NE (g)	Industrial	0	1×10 <sup>-6</sup>	4				
Child	0	6×10 <sup>-3</sup>	1	Construction	0	3×10 <sup>-7</sup>	4				

- (a) No risks, HIs, or blood lead levels are above comparison levels. Area-weighted values are presented.
- (b) TPHCs were detected at a maximum concentration of 12,200 µg/g. The target concentration of TPHCs under State guidelines for petroleum-contaminated sites (UDEQ, 1997) is 10,000 µg/g.
- (c) The recommended corrective measures alternative appears in bold italic type.
- (d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario.
- (e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario.
- (f) Blood lead levels for industrial and construction workers are expressed as the concentration (µg/dL) limit for 95 percent of the population. The CDC defines a limit of 10 µg/dL. Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10 µg/dL (should not exceed 5 percent).
- (g) Not evaluated.

(south end) for 2 consecutive years. The annual site review consists of site inspection, quarterly soil sample collection/analysis for TPHCs at the area of concern, assessment of results, and preparation of a letter report documenting the findings and recommendations. Results are evaluated with respect to the Phase II RFI (SAIC, 1997) data to assess the extent of natural attenuation of TPHCs. The second annual site review recommends either continuation or cessation of site reviews. Site reviews are no longer required only if TPHC concentrations have attenuated to below the State of Utah screening level of 10,000 µg/g (UDEQ, 1997). An alternate corrective measure may be recommended at the 2-year review if it is determined that natural attenuation is not occurring.

Alternative 1 – monitored natural attenuation (MNA) – is evaluated as follows:

- Technical criteria

- Performance – The initial concentration of TPHCs in soil at Building 522 (south end) exceeds the quantitative CAO (10,000 µg/g) developed in the CMS Work Plan (Dames & Moore, 2000). Although this alternative does not include the active treatment of TPHC-contaminated soil, MNA may reduce TPHC concentrations to acceptable levels within 1 to 2 years because these constituents have half-lives of less than 1 month and are highly susceptible to biodegradation (Brady et al., 1997).

MNA is applicable to the TPHCs identified as COCs in surface soil because petroleum contaminants are generally degradable in aerobic environments. However, because many factors that affect the rate of natural attenuation (i.e., soil moisture, porosity, oxygen content, pH, and presence of bacterial populations in soil) at TEAD are not favorable for biological processes, it is likely to take longer than the measured half-lives for natural attenuation to achieve the CAOs for organic COCs. If it is shown that natural attenuation is not occurring after 2 years of monitoring, another corrective measure will be considered.

- Reliability – MNA is effective over the long term and has been implemented at many sites with positive results. Although no management of waste materials is required, it is necessary to monitor and document the natural attenuation of TPHCs.
- Implementability – MNA is technically and administratively feasible at Building 522 (south end). Equipment and materials required for implementation of this alternative are readily available. The concentration of TPHCs in soil is expected to meet the target of 10,000 µg/g within 1 to 2 years.
- Safety – Because no intrusive activities other than surface soil sampling are required, this alternative poses no potential threats to off-post residential

communities or the environment. The minimal risks to workers associated with surface soil sampling is easily mitigated using conventional safety measures.

- Human health assessment – There are no unacceptable human health risks or HIs at Building 522 (south end). However, TPHC levels are above the State of Utah screening level of 10,000 µg/g (UDEQ, 1997) and warrant action. MNA data will help ascertain whether the TPHC levels diminish over time.
- Environmental assessment – MNA does not affect the ecological environment. The SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at Building 522 (south end).
- Administrative feasibility – MNA meets the requirements of UAC R315-101. The target concentration of 10,000 µg/g (UDEQ, 1997) is likely to be met within 1 to 2 years.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$37,800. Table A-6 (Appendix A) presents the detailed cost estimate.

7.1.2.2 Alternative 2 – Excavation and Off-Post Treatment/Disposal. This corrective measures alternative includes excavation of contaminated surface soil (Figure 7-3) to a depth of 1 foot using an excavator, backhoe, or similar equipment. Excavation and confirmatory sampling continue until the concentrations of TPHCs are detected below the target level of 10,000 µg/g.

Based on the results of a soil profile analysis (including total waste and TCLP analysis), the excavated soil is transported to an off-post Subtitle C hazardous waste landfill for direct disposal or to a treatment, storage, and disposal facility (TSDF) for treatment prior to disposal. For the purposes of this CMS, it is assumed that the contaminated soil is sent to a TSDF for pretreatment by incineration to comply with applicable RCRA Land Disposal Restrictions (LDRs). However, the contaminated soil may also be sent to a local asphalt batching plant. The excavated soil is transported and manifested in compliance with applicable regulations. Clean soil from an on-post borrow location is backfilled into the excavated areas, which are then covered with either asphalt, concrete, or gravel as appropriate to return the site to a usable status.

Alternative 2 – excavation and off-post treatment/disposal – is evaluated as follows:

- Technical criteria
  - Performance – This alternative meets both the qualitative and quantitative CAOs developed in the CMS Work Plan (Dames & Moore, 2000). It also

complies with UAC R315-101-3, the “Principle of Non-Degradation,” by removing contaminated soil from the site. Alternative 2 reduces the toxicity and mobility of contaminants, and meets the identified goals with no decrease in effectiveness over time.

- Reliability – Excavation and off-post treatment/disposal is effective over the long term and has been implemented effectively at many sites.
- Implementability – This alternative is technically and administratively feasible at Building 522 (south end). Excavation equipment is readily available, and a Subtitle C landfill and a TSDF are located within 100 miles of TEAD. Because Alternative 2 requires excavation to only 1 foot below ground surface (bgs), the possible presence of subsurface utilities should not affect its implementation. Approximately 1 week is required to complete the excavation, off-post treatment/disposal activities, and backfilling, and to meet the CAOs.
- Safety – Alternative 2 poses moderate short-term risks to onsite workers and off-post residential communities during transport and off-post treatment/disposal of the soil. Onsite workers may be exposed to contaminated soil during excavation and other soil-handling activities. However, the use of conventional safety measures, as well as other protective measures such as dust suppression and monitoring, minimize health risks to workers. Compliance with all applicable requirements for the transport of hazardous materials minimizes this risk and essentially eliminates the potential for community impacts.
- Human health assessment – Excavation and off-post treatment/disposal protect human health by preventing both short- and long-term exposure to contaminated soil.
- Environmental assessment – The SWERA (Rust E&I, 1997) identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 522 (south end).
- Administrative feasibility – Alternative 2 complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101 and UAC R311-211. Because all soil containing TPHC levels above the CAOs is excavated and removed from the site, this alternative meets the human health risk criteria under UAC R315-101-6. The excavated soil is transported in accordance with U.S. Department of Transportation (DOT) regulations.
- Cost – The estimated present worth cost of implementing Alternative 2 is \$15,300. Table A-7 (Appendix A) presents the detailed cost estimate.

### 7.1.3 Comparative Analysis of Corrective Measures Alternatives

Table 7-2 and the text below summarize the comparative analysis of the two corrective measures alternatives identified for Building 522 (south end).

- Technical criteria
  - Performance – Alternative 2 (excavation and off-post treatment/disposal) immediately reduces the mobility of TPHCs and achieves the target TPHC soil concentration of 10,000 µg/g (UDEQ, 1997) in less than 1 week. Under Alternative 1 (MNA), TPHC concentrations may be reduced to acceptable levels through natural degradation processes in 1 to 2 years. Alternative 2 provides a higher level of performance by immediately achieving both qualitative and quantitative objectives.
  - Reliability – Each of the alternatives has been implemented successfully at other sites and is considered to be reliable. Alternative 2 requires no O&M or long-term monitoring; Alternative 1 requires annual sampling and analysis to document natural attenuation. Some degree of long-term liability may be associated with Alternative 2.
  - Implementability – Both of these alternatives can be readily implemented at Building 522 (south end). The building is located within the Administration Area of TEAD and is scheduled to remain under continued military use.
  - Safety – Minimal risks are associated with sampling for Alternative 1 and excavation activities for Alternative 2; however, these risks are easily mitigated using conventional safety measures. The transport of contaminated soil in Alternative 2 presents minor risks to off-post residential communities.
- Human health assessment – There are no unacceptable human health risks or HIs at Building 522 (south end); however, the TPHC levels warrant action. Because Alternative 2 more efficiently removes TPHCs, it is more protective of overall human health.

TABLE 7-2

Comparative Analysis of Corrective Measures Alternatives  
Used Oil Dumpsters (SWMU 46) – Building 522 (South End) (a)

Corrective Measures Alternatives	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
	Performance	Reliability	Implementability	Safety				
1. Monitored natural attenuation	Moderate	Moderate	Moderate	High	High	High	High	\$37,800
2. Excavation and off-post treatment/disposal	High	High	High	Moderate	High	High	High	\$15,300

(a) Rankings of high, moderate, or low indicate the effectiveness of each alternative in meeting the evaluation criteria, relative to other alternatives.

- Environmental assessment – The sitewide ecological assessment identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 522 (south end).
- Administrative feasibility – Alternative 2 readily meets the target concentration of 10,000 µg/g for TPHC-contaminated soil (UDEQ, 1997). Alternative 1 is expected to meet this requirement within 1 to 2 years of implementation. Alternative 2 is expected to meet universal treatment standards (UTSs) for petroleum-contaminated soil before the soil is disposed in a landfill; it also complies with UAC R307-12. Both alternatives meet the requirements of UAC R315-101.
- Cost – The estimated costs of Alternatives 1 and 2 are \$37,800 and \$15,300, respectively.

#### 7.1.4 Recommended Corrective Measures Alternative

Based on the comparative analysis, Alternative 2 is recommended as the preferred alternative for Building 522 (south end). It includes excavation and off-post treatment/disposal of TPHC-contaminated soil, and meets the CAOs identified at this site. Because Alternative 2 is easily implemented, the time required to meet the quantitative CAO is not expected to be significant. It is likely to take a longer time for Alternative 1 to achieve the quantitative CAO. Alternative 2 is reliable, cost-effective, readily implementable, protective of human health and the environment, and meets the requirements of UAC R315-101.

### 7.2 BUILDING 602 (SOUTHWEST CORNER)

#### 7.2.1 Summary of RAs and CMS Work Plan

Building 602 (southwest corner) is a former collection area where used oil from vehicle maintenance operations was stored in dumpsters. The dumpsters were routinely emptied by a recycling contractor, and the oil was taken offsite for disposal. Maximum TPHC concentrations in surface soil exceeded the 10,000 µg/g screening level identified in State guidelines for screening petroleum-contaminated sites (UDEQ, 1997). TPHCs were detected at concentrations ranging from 192 to 24,800 µg/g; concentrations exceeded the 10,000 µg/g screening level at three locations.

The Phase II RFI (SAIC, 1997) identified no unacceptable risks to human health at Building 602 (southwest corner) under the hypothetical future residential, realistic future industrial worker, or realistic future construction worker land use scenarios.



No groundwater monitoring was conducted at SWMU 46. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater.

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 46 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition, the Phase II RFI Report (SAIC, 1997) concluded that there are no expected ecological receptors and no ecological habitat.

The CMS Work Plan (Dames & Moore, 2000) identified TPHCs as a COC in surface soil at Building 602 (southwest corner). The maximum TPHC concentration (24,800 µg/g) exceeds the State of Utah screening level of 10,000 µg/g (UDEQ, 1997).

The CAOs at Building 602 (southwest corner) are:

- To comply with UAC R315-101 and all its parts.
- To protect other media from further degradation (i.e., to ensure that contamination does not increase beyond existing levels per UAC R315-101-3).
- To meet the requirements of *Guidelines for Utah's Tier 1 Risk-Based Corrective Action* for petroleum-contaminated sites (UDEQ, 1997).

Based on the evaluation of risks and hazards to human health and the environment, the identified COC, and regulatory requirements, only active corrective measures are evaluated for Building 602 (southwest corner). The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternatives for this area of SWMU 46:

<b>USED OIL DUMPSTERS (SWMU 46), Building 602 (Southwest Corner)</b>
<b>Alternative 1: Monitored natural attenuation</b>
Monitor TPHC concentrations in soil to document natural attenuation.
<b>Alternative 2: Excavation and off-post treatment/disposal</b>
Excavate and treat/dispose of TPHC-contaminated soil off post.

Figure 7-4 shows the approximate area of contaminated soil. Because the contamination may be localized around sample locations where the screening level was exceeded, it is likely that the estimated volume of contamination is biased high. Assuming that the estimated area of potential contamination is 300 ft<sup>2</sup>, at a depth of 1.0 foot, the estimated volume of contamination is 11 yd<sup>3</sup>.

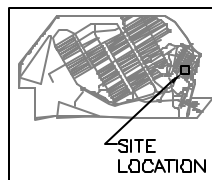
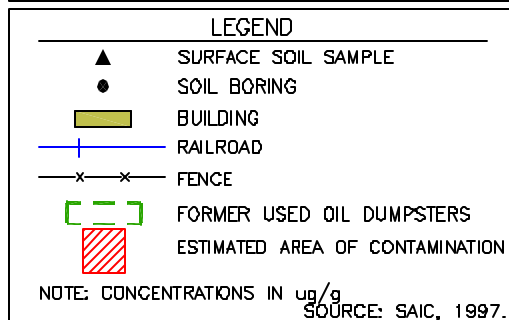
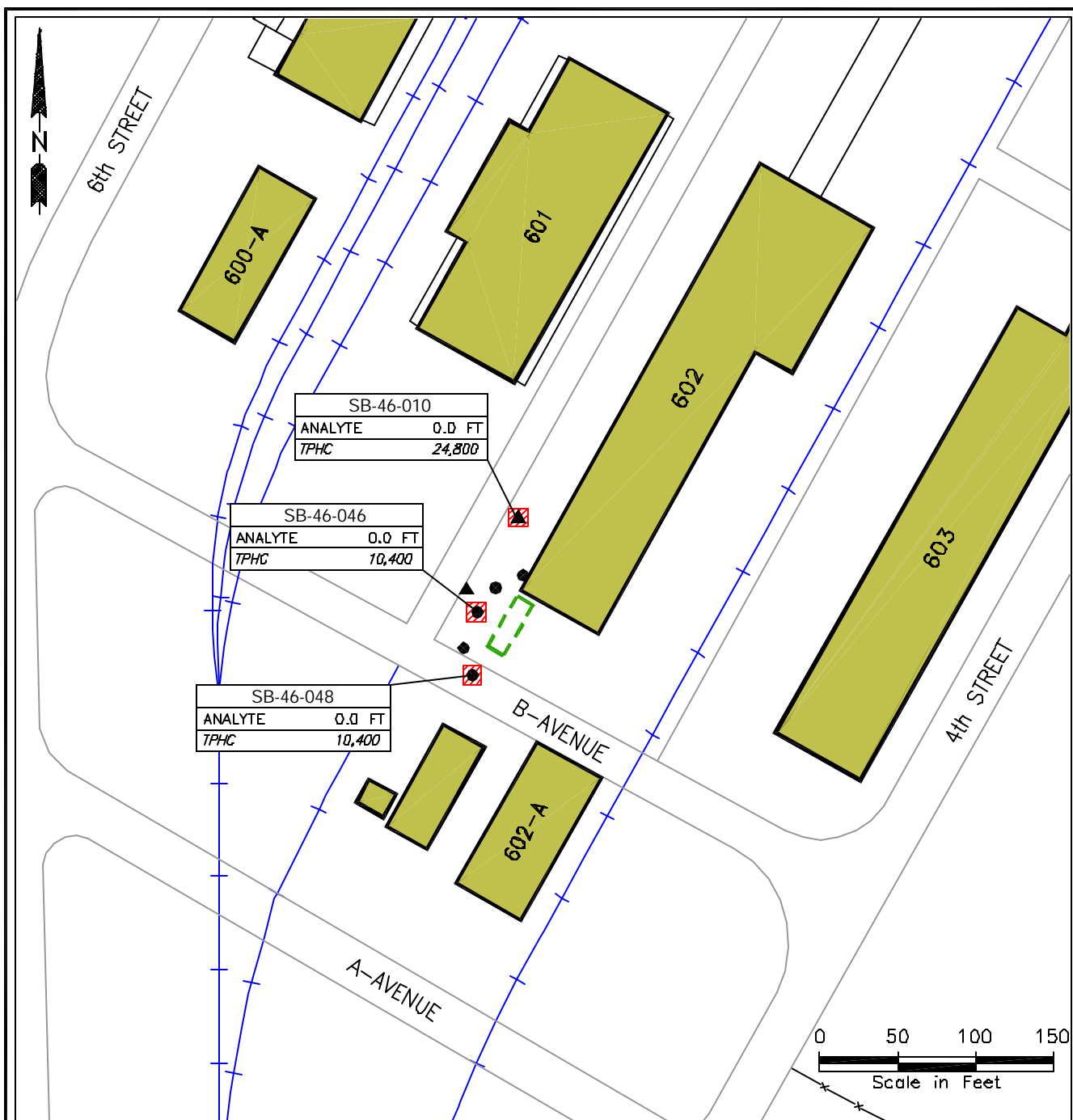


FIGURE 7-4  
COC LOCATIONS AND ESTIMATED  
AREA OF CONTAMINATION  
USED OIL DUMPSTERS,  
MAINTENANCE AREA,  
BUILDING 602 (SWMU 46)  
TOOELE ARMY DEPOT

Table 7-3 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternatives identified for Building 602 (southwest corner) in the CMS Work Plan (Dames & Moore, 2000).

## 7.2.2 Detailed Evaluation of Corrective Measures Alternatives

7.2.2.1 Alternative 1 – Monitored Natural Attenuation. Alternative 1 includes quarterly monitoring and documenting the natural attenuation of TPHCs in surface soil at Building 602 (southwest corner) for 2 consecutive years. The annual site review consists of site inspection, quarterly soil sample collection/analysis for TPHCs at the areas of concern, assessment of results, and preparation of a letter report documenting the findings and recommendations. Results are evaluated with respect to the Phase II RFI (SAIC, 1997) data to assess the extent of natural attenuation of TPHCs. The second annual site review recommends either continuation or cessation of site reviews. Site reviews are no longer required only if TPHC concentrations have attenuated to below the State of Utah screening level of 10,000 µg/g (UDEQ, 1997). An alternate corrective measure may be recommended at the 2-year review if it is determined that natural attenuation is not occurring.

Alternative 1 – MNA – is evaluated as follows:

- Technical criteria
  - Performance – The initial concentration of TPHCs in soil at Building 602 (southwest corner) exceeds the quantitative CAO (10,000 µg/g) developed in the CMS Work Plan (Dames & Moore, 2000). Although this alternative does not include active treatment of TPHC-contaminated soil, MNA may reduce TPHC concentrations to acceptable levels within 1 to 2 years because these constituents have half-lives of less than 1 month and are highly susceptible to biodegradation (Brady et al., 1997).

MNA is applicable to the TPHCs identified as COCs in surface soil because petroleum contaminants are generally degradable in aerobic environments. However, because many factors that affect the rate of natural attenuation (i.e., soil moisture, porosity, oxygen content, pH, and presence of bacterial populations in soil) at TEAD are not favorable for biological processes, it is likely to take longer than the measured half-lives for natural attenuation to achieve the CAOs for organic COCs. If it is shown that natural attenuation is not occurring after 2 years of monitoring, another corrective measure will be considered.

- Reliability – MNA is effective over the long term and has been implemented at many sites with positive results. Although no management of waste

TABLE 7-3

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Used Oil Dumpsters (SWMU 46) - Building 602 (Southwest Corner)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)	
Human Health Risk Assessment (a)								Impacts to Groundwater	Ecological Risk	Corrective Measures Alternatives (c)
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: TPHCs
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)			Monitored natural attenuation <i>Excavation and off-post treatment/disposal</i>
Adult	$5 \times 10^{-10}$	0.08	NE (g)	Industrial	$3 \times 10^{-10}$	$3 \times 10^{-3}$	NE			
Child	$5 \times 10^{-10}$	0.2	NE	Construction	$1 \times 10^{-11}$	$7 \times 10^{-4}$	NE			

(a) No risks, HIs, or blood lead levels are above comparison levels. Area-weighted values are presented.

(b) TPHCs were detected at a maximum concentration of 24,800 µg/g. The target concentration of TPHCs under State guidelines for petroleum-contaminated sites (UDEQ, 1997) is 10,000 µg/g.

(c) The recommended corrective measures alternative appears in bold italic type.

(d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario.

(e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario.

(f) Blood lead levels for industrial and construction workers are expressed as the concentration (µg/dL) limit for 95 percent of the population. The CDC defines a limit of 10 µg/dL. Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10 µg/dL (should not exceed 5 percent).

(g) Not evaluated.

materials is required, it is necessary to monitor and document the natural attenuation of TPHCs.

- Implementability – MNA is technically and administratively feasible at Building 602 (southwest corner). Equipment and materials required for implementation of this alternative are readily available. The concentration of TPHCs in soil is expected to meet the target of 10,000 µg/g within 1 to 2 years.
- Safety – Because no intrusive activities other than surface soil sampling are required, this alternative poses no potential threats to off-post residential communities or the environment. The minimal risks to workers associated with surface soil sampling is easily mitigated using conventional safety measures.
- Human health assessment – There are no unacceptable human health risks or HIs at Building 602 (southwest corner). However, TPHC levels are above the State of Utah screening level of 10,000 µg/g (UDEQ, 1997) and warrant action. MNA data will help ascertain whether the TPHC levels diminish over time.
- Environmental assessment – MNA does not affect the ecological environment. The SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at Building 602 (southwest corner).
- Administrative feasibility – MNA meets the requirements of UAC R315-101. The target concentration of 10,000 µg/g (UDEQ, 1997) is likely to be met within 1 to 2 years.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$37,800. Table A-8 (Appendix A) presents the detailed cost estimate.

7.2.2.2 Alternative 2 – Excavation and Off-Post Treatment/Disposal. This corrective measures alternative includes excavation of contaminated surface soil (Figure 7-4) to a depth of 1 foot using an excavator, backhoe, or similar equipment. Excavation and confirmatory sampling continue until the concentrations of TPHCs are detected below the target level of 10,000 µg/g.

Based on the results of a soil profile analysis (including total waste and TCLP analysis), the excavated soil is transported to an off-post Subtitle C hazardous waste landfill for direct disposal or to a TSDF for treatment prior to disposal. For the purposes of this CMS, it is assumed that the contaminated soil is sent to a TSDF for pretreatment by incineration to comply with applicable RCRA LDRs. The contaminated soil may also be sent

to a local asphalt batching plant. The excavated soil is transported and manifested in compliance with applicable regulations. Clean soil from an on-post borrow location is backfilled into the excavated areas, which are then covered with either asphalt, concrete, or gravel as appropriate to return the site to a usable status.

Alternative 2 – excavation and off-post treatment/disposal – is evaluated as follows:

- Technical criteria
  - Performance – This alternative meets both the qualitative and quantitative CAOs developed in the CMS Work Plan (Dames & Moore, 2000). It also complies with UAC R315-101-3, the “Principle of Non-Degradation,” by removing contaminated soil from the site. Alternative 2 reduces the toxicity and mobility of contaminants, and meets the identified goals with no decrease in effectiveness over time.
  - Reliability – Excavation/off-post treatment/disposal is effective over the long term and has been implemented effectively at many sites.
  - Implementability – This alternative is technically and administratively feasible at Building 602 (southwest corner). Excavation equipment is readily available, and a Subtitle C landfill and a TSDf are located within 100 miles of TEAD. Because Alternative 2 requires excavation to only 1 foot bgs, the possible presence of subsurface utilities should not affect its implementation. Approximately 1 week is required to complete the excavation, off-post treatment/disposal activities, and backfilling, and to meet the CAOs.
  - Safety – Alternative 2 poses moderate short-term risks to onsite workers and off-post residential communities during transport and off-post treatment/disposal of the soil. Onsite workers may be exposed to contaminated soil during excavation and other soil-handling activities. However, the use of conventional safety measures, as well as other protective measures such as dust suppression and monitoring, minimize health risks to workers. Compliance with all applicable requirements for the transport of hazardous materials minimizes this risk and essentially eliminates the potential for community impacts.
- Human health assessment – Excavation and off-post treatment/disposal protect human health by preventing both short- and long-term exposure to contaminated soil.
- Environmental assessment – The SWERA (Rust E&I, 1997) identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 602 (southwest corner).

- Administrative feasibility – Alternative 2 complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101 and UAC R311-211. Because all soil containing TPHC levels above the CAOs is excavated and removed from the site, this alternative meets the human health risk criteria under UAC R315-101-6. The excavated soil is transported in accordance with DOT regulations.
- Cost – The estimated present worth cost of implementing Alternative 2 is \$22,600. Table A-9 (Appendix A) presents the detailed cost estimate.

### 7.2.3 Comparative Analysis of Corrective Measures Alternatives

Table 7-4 and the text below summarize the comparative analysis of the two corrective measures alternatives identified for Building 602 (southwest corner).

- Technical criteria
  - Performance – Alternative 2 (excavation and off-post treatment/disposal) immediately reduces the mobility of TPHCs and achieves the target TPHC soil concentration of 10,000 µg/g (UDEQ, 1997) in less than 1 week. Under Alternative 1 (MNA), TPHC concentrations may be reduced to acceptable levels through natural degradation processes in 1 to 2 years. Alternative 2 provides a higher level of performance by immediately achieving both qualitative and quantitative objectives.
  - Reliability – Each of the alternatives has been implemented successfully at other sites and is considered to be reliable. Alternative 2 requires no O&M or long-term monitoring; Alternative 1 requires minimal sampling and analysis to document natural attenuation. Some degree of long-term liability may be associated with Alternative 2.
  - Implementability – Both of these alternatives can be readily implemented at Building 602 (southwest corner). The building is located within the Maintenance Area of TEAD and is part of the BRAC parcel.
  - Safety – Minimal risks are associated with sampling for Alternative 1 and excavation activities for Alternative 2; however, these risks are easily mitigated using conventional safety measures. The transport of contaminated soil in Alternative 2 presents minor risks to off-post residential communities.

TABLE 7-4

Comparative Analysis of Corrective Measures Alternatives  
Used Oil Dumpsters (SWMU 46) – Building 602 (Southwest Corner) (a)

Corrective Measures Alternatives	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
	Performance	Reliability	Implementability	Safety				
1. Monitored natural attenuation	Moderate	Moderate	Moderate	High	High	High	High	\$37,800
2. Excavation and off-post treatment/disposal	High	High	High	Moderate	High	High	High	\$22,600

(a) Rankings of high, moderate, or low indicate the effectiveness of each alternative in meeting the evaluation criteria, relative to other alternatives.



- Human health assessment – There are no unacceptable human health risks or HIs at Building 602 (southwest corner); however, the TPHC levels warrant action. Because Alternative 2 more efficiently removes TPHCs, it is more protective of overall human health.
- Environmental assessment – The sitewide ecological assessment identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 602 (southwest corner).
- Administrative feasibility – Alternative 2 readily meets the target concentration of 10,000 µg/g for TPHC-contaminated soil (UDEQ, 1997). Alternative 1 is expected to meet this requirement within 1 to 2 years of implementation. Alternative 2 is expected to meet UTSs for petroleum-contaminated soil before the soil is disposed in a landfill; it also complies with UAC R307-12. Both alternatives meet the requirements of UAC R315-101.
- Cost – The estimated costs of Alternatives 1 and 2 are \$37,800 and \$22,600, respectively.

#### 7.2.4 Recommended Corrective Measures Alternative

Based on the comparative analysis, Alternative 2 is recommended as the preferred alternative for Building 602 (southwest corner). It includes excavation and off-post treatment/disposal of TPHC-contaminated soil, and meets the CAOs identified at this site. Because Alternative 2 is easily implemented, the time required to meet the quantitative CAO is not expected to be significant. It is likely to take a longer time for Alternative 1 to achieve the quantitative CAO. Alternative 2 is reliable, cost-effective, readily implementable, protective of human health and the environment, and meets the requirements of UAC R315-101.

### 7.3 BUILDING 611 (NORTHWEST CORNER)

#### 7.3.1 Summary of RAs and CMS Work Plan

Building 611 (northwest corner) is a former collection area where used oil from vehicle maintenance operations was stored in two dumpsters. The dumpsters were routinely emptied by a recycling contractor, and the oil was taken offsite for disposal. Maximum TPHC concentrations in surface soil exceeded the 10,000-µg/g screening level identified in the State guidelines for screening petroleum-contaminated sites (UDEQ, 1997). TPHCs were detected at concentrations ranging from 216 to 50,700 µg/g. Four sample locations exceeded the 10,000-µg/g screening level.

The Phase II RFI (SAIC, 1997) identified unacceptable risks to human health at Building 611 (northwest corner) under the hypothetical future residential and realistic future industrial worker land use scenarios. Therefore, according to EPA guidance and UAC R315-

101-6(e), this area of SWMU 46 is included in the CMS process, and corrective measures must be evaluated.

No groundwater monitoring was conducted at SWMU 46. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater.

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 46 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition, the Phase II RFI Report (SAIC, 1997) concluded that there are no expected ecological receptors and no ecological habitat.

The CMS Work Plan (Dames & Moore, 2000) identified TPHCs and lead as COCs in surface soil at Building 611 (northwest corner). The maximum TPHC concentration (50,700 µg/g) exceeds the State of Utah screening level of 10,000 µg/g (UDEQ, 1997). Lead was detected at a concentration exceeding its CAO in one sample only.

Because the dumpster at Building 611 (northwest corner) is located within the Sandblast Area (SWMU 54, Group C), the Phase II RFI Report (SAIC, 1997) recommends that corrective measures for the dumpster area be combined with corrective measures that may be required for SWMU 54. The Group C CMS Report will address the one sample at SWMU 46 that contains lead above its CAO; it is not further evaluated in this report.

The CAOs at Building 611 (northwest corner) are:

- To ensure that – if the identified industrial land use scenario changes in the future to residential or other use – appropriate measures are taken to adequately protect human health and the environment.
- To comply with UAC R315-101 and all its parts.
- To protect other media from further degradation (i.e., to ensure that contamination does not increase beyond existing levels per UAC R315-101-3).
- To meet the requirements of *Guidelines for Utah's Tier 1 Risk-Based Corrective Action* for petroleum-contaminated sites (UDEQ, 1997).

Based on the evaluation of risks and hazards to human health and the environment, the identified COCs, and regulatory requirements, the CMS Work Plan (Dames & Moore, 2000) identified active corrective measures (i.e., treatment technologies) as well as management measures for Building 611 (northwest corner). Management measures are required because – as shown in Table 7-5 – the reasonable maximum exposure (RME)

TABLE 7-5

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Used Oil Dumpsters (SWMU 46) - Building 611 (Northwest Corner)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)		
Human Health Risk Assessment (a)						Impacts to Groundwater		Ecological Risk	COCs (b)	Corrective Measures Alternatives (c)	
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: TPHCs Lead	Monitored natural attenuation and deed restrictions <i>Excavation, off-post treatment/ disposal, and deed restrictions</i>
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)				
Adult	2×10 <sup>-9</sup>	1	NE (g)	Industrial	2×10 <sup>-10</sup>	0.07	4				
Child	1×10 <sup>-9</sup>	3	2	Construction	7×10 <sup>-11</sup>	0.02	4				

- (a) Risks, HIs, and blood lead levels that are above comparison levels appear in bold type. Area weighted values are presented.
- (b) TPHCs were detected at a maximum concentration of 50,700 µg/g. The target concentration of TPHCs under the State guidelines for petroleum-contaminated sites (UDEQ, 1997) is 10,000 µg/g. Lead was detected at a concentration exceeding its CAO in one sample only.
- (c) The recommended corrective measures alternative appears in bold italic type.
- (d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario. Because HIs are greater than 1.0, EPA guidance and UAC R315-101-6(c)(3) indicate that a CMS must be performed.
- (e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario. Because risks and HIs are less than  $1 \times 10^{-4}$  and 1.0, respectively, UAC R315-101-6(d) indicates that management measures can be evaluated.
- (f) Blood lead levels for industrial and construction workers are expressed as the concentration (µg/dL) limit for 95 percent of the population. The CDC defines a limit of 10 µg/dL. Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10 µg/dL (should not exceed 5 percent).
- (g) Not evaluated.

noncancer HI exceeds the regulatory target of 1.0 for the hypothetical future child resident. The CMS Work Plan identified the following corrective measures alternatives for this area of SWMU 46:

<b>USED OIL DUMPSTERS (SWMU 46), Building 611 (Northwest Corner)</b>
<b>Alternative 1: Monitored natural attenuation and deed restrictions</b>
Monitor TPHC concentrations in soil to document natural attenuation. Impose deed restrictions to prevent future residential development.
<b>Alternative 2: Excavation, off-post treatment/disposal, and deed restrictions</b>
Excavate and treat/dispose of TPHC-contaminated soil off post. Impose deed restrictions to prevent future residential development.

Figure 7-5 shows the approximate area of contaminated soil. Because the contamination may be localized around the sample locations where the screening level or CAO was exceeded, it is likely that the estimated volume of contamination is biased high. Based on the four COC locations, the combined estimated area of potential TPHC contamination is 400 ft<sup>2</sup>. The estimated depth of contamination is 1 foot beneath each of the COC locations except SB-46-007, which has an assumed depth of contamination of 3.5 feet. Therefore, the combined estimated volume of contamination is 24 yd<sup>3</sup>.

Table 7-5 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternatives identified for Building 611 (northwest corner) in the CMS Work Plan (Dames & Moore, 2000).

### 7.3.2 Detailed Evaluation of Corrective Measures Alternatives

7.3.2.1 Alternative 1 – Monitored Natural Attenuation and Deed Restrictions. Alternative 1 includes quarterly monitoring and documenting the natural attenuation of TPHCs in surface soil at Building 611 (northwest corner) for 2 consecutive years, and deed restrictions to prevent future residential use of this area of SWMU 46. The annual site review consists of site inspection, quarterly soil sample collection/analysis for TPHCs at the areas of concern, assessment of results, and preparation of a letter report documenting the findings and recommendations. Results are evaluated with respect to the Phase II RFI (SAIC, 1997) data to assess the extent of natural attenuation of TPHCs. The second annual site review recommends either continuation or cessation of site reviews. Site reviews are no longer required only if TPHC concentrations have attenuated to below the State of Utah screening level of 10,000 µg/g (UDEQ, 1997). An alternate corrective measure may be recommended at the 2-year review if it is determined that natural attenuation is not occurring.

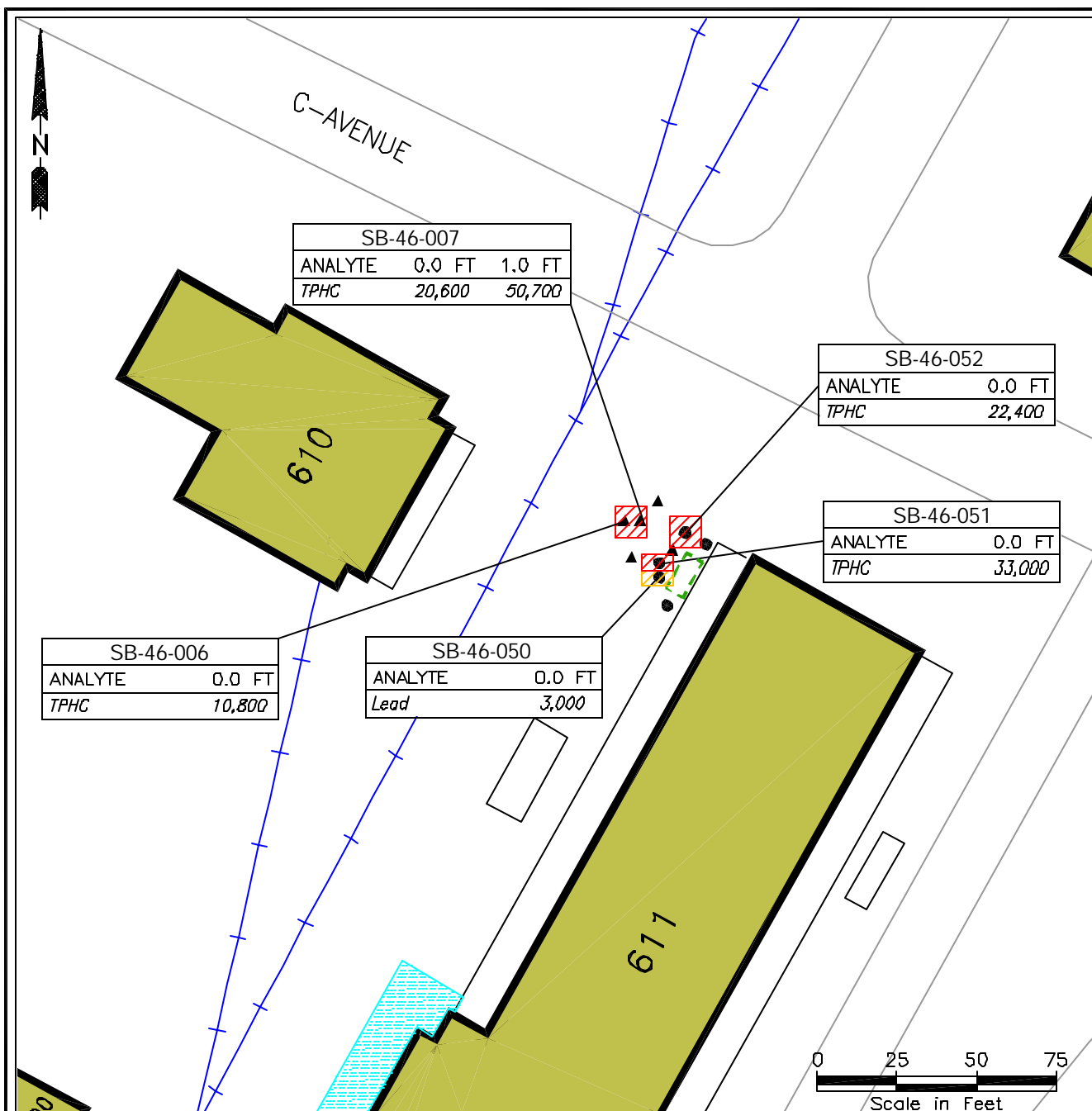


FIGURE 7-5  
ESTIMATED AREA OF EXCAVATION  
BUILDING 611 (SWMU 46)  
TOOELE ARMY DEPOT

Deed restrictions are legally binding and would be incorporated into the deed created for the transfer of the BRAC parcel from TEAD to the buyer. These restrictions on the BRAC property are governed by the CCRs as discussed in Section 3.1.2. Deed restrictions on this area of SWMU 46 apply within the SWMU boundary presented on Figure 7-2 and as defined in Exhibit C of the CCRs.

Alternative 1 – MNA and deed restrictions – is evaluated as follows:

- Technical criteria

- Performance – The initial concentration of TPHCs in soil at Building 611 (northwest corner) exceeds the quantitative CAO (10,000 µg/g) developed in the CMS Work Plan (Dames & Moore, 2000). Although this alternative does not include active treatment of TPHC-contaminated soil, MNA may reduce TPHC concentrations to acceptable levels within 1 to 2 years because these constituents have half-lives of less than 1 month and are highly susceptible to biodegradation (Brady et al., 1997).

MNA is applicable to the TPHCs identified as COCs in surface soil because petroleum contaminants are generally degradable in aerobic environments. However, because many factors that affect the rate of natural attenuation (i.e., soil moisture, porosity, oxygen content, pH, and presence of bacterial populations in soil) at TEAD are not favorable for biological processes, it is likely to take longer than the measured half-lives for natural attenuation to achieve the CAOs for organic COCs. If it is shown that natural attenuation is not occurring after 2 years of monitoring, another corrective measure will be considered.

- Reliability – MNA is effective over the long term and has been implemented at many sites with positive results. Although no management of waste materials is required, it is necessary to monitor and document the natural attenuation of TPHCs.
- Implementability – MNA is technically and administratively feasible at Building 611 (northwest corner). Equipment and materials required for implementation of this alternative are readily available. The concentration of TPHCs in soil is expected to meet the target of 10,000 µg/g within 1 to 2 years. The future land use for Building 611 is industrial because it is part of the BRAC parcel; therefore, implementing deed restrictions should not be difficult.
- Safety – Because no intrusive activities other than surface soil sampling are required, this alternative poses no potential threats to off-post residential communities or the environment. The minimal risks to workers associated

with surface soil sampling is easily mitigated using conventional safety measures.

- Human health assessment – There are no unacceptable human health risks or HIs at Building 611 (northwest corner). However, TPHC levels are above the State of Utah screening level of 10,000 µg/g (UDEQ, 1997) and warrant action. MNA data will help ascertain whether the TPHC levels diminish over time. In addition, restricting future residential development through deed restrictions prevents exposure to soil contaminants.
- Environmental assessment – MNA and deed restrictions do not affect the ecological environment. The SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at Building 611 (northwest corner).
- Administrative feasibility – MNA and deed restrictions meet the requirements of UAC R315-101. The target concentration of 10,000 µg/g (UDEQ, 1997) is likely to be met within 1 to 2 years.
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$58,800. Table A-10 (Appendix A) presents the detailed cost estimate.

7.3.2.2 Alternative 2 – Excavation, Off-Post Treatment/Disposal, and Deed Restrictions. This corrective measures alternative includes excavation of contaminated surface soil (Figure 7-5) to a depth of 1 foot at three sample locations and contaminated subsurface soil to a depth of 3.5 feet at one location using an excavator, backhoe, or similar equipment; and also deed restrictions to prevent future residential use of this area of SWMU 46. Excavation and confirmatory sampling continue until the concentrations of TPHCs are detected below the target level of 10,000 µg/g.

Based on the results of a soil profile analysis (including total waste and TCLP analysis), the excavated soil is transported to an off-post Subtitle C hazardous waste landfill for direct disposal or to a TSDF for treatment prior to disposal. For the purposes of this CMS, it is assumed that the contaminated soil is sent to a TSDF for pretreatment by incineration to comply with applicable RCRA LDRs. However, the contaminated soil may also be sent to a local asphalt batching plant. The excavated soil is transported and manifested in compliance with applicable regulations. Clean soil from an on-post borrow location is backfilled into the excavated areas, which are then covered with either asphalt, concrete, or gravel as appropriate to return the site to a usable status.

Deed restrictions are legally binding and would be incorporated into the deed created for the transfer of the BRAC parcel from TEAD to the buyer. These restrictions on the BRAC property are governed by the CCRs as discussed in Section 3.1.2. Deed restrictions

on this area of SWMU 46 apply within the SWMU boundary presented on Figure 7-2 and as defined in Exhibit C of the CCRs.

Alternative 2 – excavation, off-post treatment/disposal, and deed restrictions – is evaluated as follows:

- Technical criteria
  - Performance – This alternative meets both the qualitative and quantitative CAOs developed in the CMS Work Plan (Dames & Moore, 2000). It also complies with UAC R315-101-3, the “Principle of Non-Degradation,” by removing contaminated soil from the site. Alternative 2 reduces the toxicity and mobility of contaminants, and meets the identified goals with no decrease in effectiveness over time.
  - Reliability – Excavation and off-post treatment/disposal is effective over the long term and has been implemented at many sites with positive results. No additional exposure should occur while the deed restrictions are in place.
  - Implementability – This alternative is technically and administratively feasible at Building 611 (northwest corner). Excavation equipment is readily available, and both a Subtitle C landfill and a TSDF are located within 100 miles of TEAD. Equipment and materials are readily available. This alternative meets the CAOs when the contaminated soil is disposed of off post. The future land use for Building 611 is industrial because it is part of the BRAC parcel; therefore, implementing deed restrictions should not be difficult.
  - Safety – Alternative 2 poses moderate short-term risks to onsite workers and off-post residential communities during transport and off-post treatment/disposal of the soil. Onsite workers may be exposed to contaminated soil during excavation and other soil-handling activities. However, the use of conventional safety measures, as well as other protective measures such as dust suppression and monitoring, minimize health risks to workers. Compliance with all applicable requirements for the transport of hazardous materials minimizes this risk and essentially eliminates the potential for community impacts.
- Human health assessment – Excavation and off-post treatment/disposal protect human health by preventing both short- and long-term exposure to contaminated soil. Restricting residential development through deed restrictions prevents potential exposure to soil contaminants onsite.
- Environmental assessment – This alternative does not affect the surrounding environment. The SWERA (Rust E&I, 1997) identified no adverse effects to



ecological receptors as a result of the contaminants in soil at Building 611 (northwest corner).

- Administrative feasibility – Alternative 2 complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101 and UAC R311-211. Because all soil containing TPHC levels above the CAOs is excavated and removed from Building 611, this alternative meets the human health risk criteria under UAC R315-101-6. The excavated soil is transported in accordance with DOT regulations. In addition, removal of the contaminated soil achieves the target TPHC concentration of 10,000 µg/g in onsite soil (UDEQ, 1997).
- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$44,700. Table A-11 (Appendix A) presents the detailed cost estimate.

### 7.3.3 Comparative Analysis of Corrective Measures Alternatives

Table 7-6 and the text below summarize the comparative analysis of the two corrective measures alternatives identified for Building 611 (northwest corner).

- Technical criteria
  - Performance – Alternative 2 (excavation, off-post treatment/disposal, and deed restrictions) immediately reduces the mobility of TPHCs and achieves the target TPHC soil concentration of 10,000 µg/g (UDEQ, 1997) in less than 1 week. Under Alternative 1 (MNA and deed restrictions), TPHC concentrations may be reduced to acceptable levels through natural degradation processes in 1 to 2 years; deed restrictions limit future exposure by preventing residential use of the site. Alternative 2 provides a higher level of performance by immediately achieving both qualitative and quantitative objectives.
  - Reliability – Each of the alternatives has been implemented successfully at other sites and is considered to be reliable. Alternative 2 requires no O&M or long-term monitoring; Alternative 1 requires minimal sampling and analysis to document natural attenuation. Some degree of long-term liability may be associated with Alternative 2.
  - Implementability – Alternatives 1 and 2 can be readily implemented at Building 611 (northwest corner). The building is located within the Maintenance Area of TEAD and is part of the BRAC parcel. Alternatives

TABLE 7-6

Comparative Analysis of Corrective Measures Alternatives  
Used Oil Dumpsters (SWMU 46) – Building 611 (Northwest Corner) (a)

Corrective Measures Alternatives	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
	Performance	Reliability	Implementability	Safety				
1. Monitored natural attenuation and deed restrictions	High	Moderate	Moderate	High	High	High	High	\$58,800
2. Excavation, off-post treatment/disposal, and deed restrictions	High	High	High	Moderate	High	High	High	\$44,700

(a) Rankings of high, moderate, or low indicate the effectiveness of each alternative in meeting the evaluation criteria, relative to other alternatives.

1 and 2 are rated high because equipment, materials, and contractors are readily available locally. It is estimated that Alternative 2 could be implemented within 1 week; Alternative 1 may take 1 to 2 years. Subsurface utilities may pose a problem for Alternatives 1 and 2 because of soil sampling/excavation at depths of 3.5 feet.

- Safety – Minimal risks are associated with sampling for Alternative 1 and excavation activities for Alternative 2; however, these risks are easily mitigated using conventional safety measures. The off-post transport of contaminated soil in Alternative 2 presents minor risks to off-post residential communities.
- Human health assessment – Alternatives 1 and 2 are protective of overall human health.
- Environmental assessment – The sitewide ecological assessment identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 611 (northwest corner).
- Administrative feasibility – Alternative 2 readily meets the target concentration of 10,000 µg/g for TPHC-contaminated soil (UDEQ, 1997). Alternative 1 is expected to meet this requirement within 1 to 2 years of implementation; however, its feasibility is questionable, and it is rated moderate. Alternative 2 is expected to meet UTSS for petroleum-contaminated soil before the soil is disposed in a landfill; it also complies with UAC R307-12. Both Alternatives 1 and 2 meet the requirements of UAC R315-101.
- Cost – The estimated costs of Alternatives 1 and 2 are \$58,800 and \$44,700, respectively.

#### 7.3.4 Recommended Corrective Measures Alternative

Based on the comparative analysis, Alternative 2 is recommended as the preferred alternative for Building 611 (northwest corner). It includes excavation, off-post treatment/disposal of TPHC-contaminated soil, and deed restrictions; and meets the CAOs identified at this site. Because Alternative 2 is easily implemented, the time required to meet the quantitative CAO is expected to be 1 week. It is likely to take a longer time for Alternative 1 (MNA and deed restrictions) to achieve the quantitative CAO. Alternative 2 is reliable, cost-effective, readily implementable, protective of human health, and meets the requirements of UAC R315-101.

## 7.4 BUILDING 619 (SOUTH ALLEY)

### 7.4.1 Summary of RAs and CMS Work Plan

Building 619 (south alley) is a former collection area where used oil from vehicle maintenance operations was stored in dumpsters. The dumpsters were routinely emptied by a recycling contractor, and the oil was taken offsite for disposal. Maximum TPHC concentrations in surface soil exceeded the 10,000- $\mu\text{g/g}$  screening level identified in the State guidelines for screening petroleum-contaminated sites (UDEQ, 1997). TPHCs were detected at concentrations ranging from 23.3 to 10,100  $\mu\text{g/g}$ . The TPHC concentration slightly exceeds the 10,000  $\mu\text{g/g}$  screening level at only one location, at 3 feet bgs.

The Phase II RFI (SAIC, 1997) identified no unacceptable risks to human health at Building 619 (south alley) under the hypothetical future residential, realistic future industrial worker, or realistic future construction worker land use scenarios.

No groundwater monitoring was conducted at SWMU 46. However, according to the Phase II RFI (SAIC, 1997), site constituents are not likely to affect groundwater quality based on the low levels of contamination in soil, low precipitation rates, high evaporation rates, and depth to groundwater.

The SWERA (Rust E&I, 1997) determined that the contaminants at SWMU 46 pose a low ecological risk and recommended no corrective measures to reduce risk. In addition, the Phase II RFI Report (SAIC, 1997) concluded that there are no expected ecological receptors and no ecological habitat.

The CMS Work Plan (Dames & Moore, 2000) identified TPHCs as a COC in the subsurface soil at Building 619 (south alley). The maximum TPHC concentration (10,100  $\mu\text{g/g}$ ) slightly exceeds the State of Utah screening level of 10,000  $\mu\text{g/g}$  (UDEQ, 1997).

The CAOs at Building 619 (south alley) are:

- To comply with UAC R315-101 and all its parts.
- To protect other media from further degradation (i.e., to ensure that levels of contamination do not increase beyond existing levels per UAC R315-101-3).
- To meet the requirements of *Guidelines for Utah's Tier 1 Risk-Based Corrective Action* for petroleum-contaminated sites (UDEQ, 1997).

Based on the evaluation of risks and hazards to human health and the environment, the identified COC, and regulatory requirements, active corrective measures are evaluated for Building 619 (south alley). The CMS Work Plan (Dames & Moore, 2000) identified the following corrective measures alternatives for this area of SWMU 46:

<b>USED OIL DUMPSTERS (SWMU 46), Building 619 (South Alley)</b>
<b>Alternative 1: Monitored natural attenuation</b>
Monitor TPHC concentrations in soil to document natural attenuation.
<b>Alternative 2: Excavation and off-post treatment/disposal</b>
Excavate and treat/dispose of TPHC-contaminated soil off post.

Figure 7-6 shows the approximate area of contaminated soil. Because the contamination may be localized around sample locations where the screening level was exceeded, it is likely that the estimated volume of contamination is biased high. Assuming that the estimated area of potential contamination is 100 ft<sup>2</sup>, to a depth of 3.5 feet bgs, the estimated volume of contamination is 13 yd<sup>3</sup>.

Table 7-7 summarizes the risks to human health and the environment evaluated in the Phase II RFI (SAIC, 1997) and the SWERA (Rust E&I, 1997), and lists the corrective measures alternatives identified for Building 619 (south alley) in the CMS Work Plan (Dames & Moore, 2000).

#### 7.4.2 Detailed Evaluation of Corrective Measures Alternatives

7.4.2.1 Alternative 1 – Monitored Natural Attenuation. Alternative 1 includes quarterly monitoring and documenting the natural attenuation of TPHCs in surface soil at Building 619 (south alley) for 2 consecutive years. The annual site review consists of site inspection, quarterly soil sample collection/analysis for TPHCs at the area of concern, assessment of results, and preparation of a letter report documenting the findings and recommendations. Results are evaluated with respect to the Phase II RFI (SAIC, 1997) data to assess the extent of natural attenuation of TPHCs. The second annual site review recommends either continuation or cessation of site reviews. Site reviews are no longer required only if TPHC concentrations have attenuated to below the State of Utah screening level of 10,000 µg/g (UDEQ, 1997). An alternate corrective measure may be recommended at the 2-year review if it is determined that natural attenuation is not occurring.

Alternative 1 – MNA – is evaluated as follows:

- Technical criteria
  - Performance – The initial concentration of TPHCs in soil at Building 619 (south alley) exceeds the quantitative CAO (10,000 µg/g) developed in the CMS Work Plan (Dames & Moore, 2000). Although this alternative does not include active treatment of TPHC-contaminated soil, MNA may reduce TPHC concentrations to acceptable levels within 1 to 2 years because these



LEGEND	
	ESTIMATED AREA OF CONTAMINATION
	SOIL SAMPLE LOCATION
	FORMER USED OIL DUMPSTER
	AREA OF UPPER LEVEL
CONCENTRATIONS IN $\mu\text{g/g}$	
	BUILDING
	FENCE
	RAILROAD
	SWMU BOUNDARY (APPROX.)

SOURCE: RUST E&I, 1995

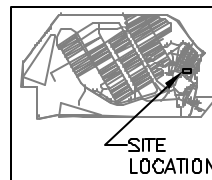


FIGURE 7-6  
ESTIMATED AREA OF EXCAVATION  
BUILDING 619 (SOUTH ALLEY)  
SWMU 46  
TOOELE ARMY DEPOT

TABLE 7-7

Summary of Phase II RFI, SWERA, and CMS Work Plan  
Used Oil Dumpsters (SWMU 46) - Building 619 (South Alley)

Phase II RFI (SAIC, 1997)								SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 2000)	
Human Health Risk Assessment (a)								Impacts to Groundwater	Ecological Risk	Corrective Measures Alternatives (c)
Hypothetical Future Residential Land Use Scenario (d)				Realistic Future Land Use Scenario (e)				None	Low	Surface soil: TPHCs
	Risk	HI	Blood Lead Level (f)		Risk	HI	Blood Lead Level (f)			Monitored natural attenuation <i>Excavation and off-post treatment/disposal</i>
Adult	$8 \times 10^{-11}$	0.01	NE (g)	Industrial	$5 \times 10^{-11}$	$5 \times 10^{-4}$	NE			
Child	$7 \times 10^{-11}$	0.03	NE	Construction	$2 \times 10^{-12}$	$1 \times 10^{-4}$	NE			

(a) No risks, HIs, or blood lead levels are above comparison levels. Area-weighted values are presented.

(b) TPHCs were detected at a maximum concentration of 10,100 µg/g. The target concentration of TPHCs under State guidelines for petroleum-contaminated sites (UDEQ, 1997) is 10,000 µg/g.

(c) The recommended corrective measures alternative appears in bold italic type.

(d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the hypothetical future land use scenario.

(e) EPA guidance and UAC R315-101-5.2(b)(2) require evaluation of the realistic future land use scenario.

(f) Blood lead levels for industrial and construction workers are expressed as the concentration (µg/dL) limit for 95 percent of the population. The CDC defines a limit of 10 µg/dL. Also, blood lead levels for children are expressed as the percentage exceeding the CDC guideline of 10 µg/dL (should not exceed 5 percent).

(g) Not evaluated.

constituents have half-lives of less than 1 month and are highly susceptible to biodegradation (Brady et al., 1997).

MNA is applicable to the TPHCs identified as COCs in surface soil because petroleum contaminants are generally degradable in aerobic environments. However, because many factors that affect the rate of natural attenuation (i.e., soil moisture, porosity, oxygen content, pH, and presence of bacterial populations in soil) at TEAD are not favorable for biological processes, it is likely to take longer than the measured half-lives for natural attenuation to achieve the CAOs for organic COCs. If it is shown that natural attenuation is not occurring after 2 years of monitoring, another corrective measure will be considered.

- Reliability – MNA is effective over the long term and has been implemented at many sites with positive results. Although no management of waste materials is required, it is necessary to monitor and document the natural attenuation of TPHCs.
- Implementability – MNA is technically and administratively feasible at Building 619 (south alley). Equipment and materials required for implementation of this alternative are readily available. The concentration of TPHCs in soil is expected to meet the target of 10,000 µg/g within 1 to 2 years.
- Safety – Because no intrusive activities other than surface soil sampling are required, this alternative poses no potential threats to off-post residential communities or the environment. The minimal risks to workers associated with surface soil sampling is easily mitigated using conventional safety measures.
- Human health assessment – There are no unacceptable human health risks or HIs at Building 619 (south alley). However, TPHC levels are above the State of Utah screening level of 10,000 µg/g (UDEQ, 1997) and warrant action. MNA data will help ascertain whether the TPHC levels diminish over time.
- Environmental assessment – MNA does not affect the ecological environment. The SWERA (Rust E&I, 1997) identified no adverse effects to ecological receptors as a result of the contaminants in soil at Building 619 (south alley).
- Administrative feasibility – MNA meets the requirements of UAC R315-101. The target concentration of 10,000 µg/g (UDEQ, 1997) is likely to be met within 1 to 2 years.



- Cost – The estimated present worth cost of implementing this corrective measures alternative is \$50,100. Table A-12 (Appendix A) presents the detailed cost estimate.

7.4.2.2 Alternative 2 – Excavation and Off-Post Treatment/Disposal. This corrective measures alternative includes excavation of contaminated surface soil (Figure 7-6) to a depth of 3.5 feet bgs using an excavator, backhoe, or similar equipment. Excavation and confirmatory sampling continue until the concentrations of TPHCs are detected below the target level of 10,000 µg/g.

Based on the results of a soil profile analysis (including total waste and TCLP analysis), the excavated soil is transported to an off-post Subtitle C hazardous waste landfill for direct disposal or to a TSDF for treatment prior to disposal. For the purposes of this CMS, it is assumed that the contaminated soil is sent to a TSDF for pretreatment by incineration to comply with applicable RCRA LDRs. However, the contaminated soil may also be sent to a local asphalt batching plant. The excavated soil is transported and manifested in compliance with applicable regulations. Clean soil from an on-post borrow location is backfilled into the excavated areas, which are then covered with either asphalt, concrete, or gravel as appropriate to return to the site to a usable status.

Alternative 2 – excavation and off-post treatment/disposal – is evaluated as follows:

- Technical criteria
  - Performance – This alternative meets both the qualitative and quantitative CAOs developed in the CMS Work Plan (Dames & Moore, 2000). It also complies with UAC R315-101-3, the “Principle of Non-Degradation,” by removing contaminated soil from the site. Alternative 2 reduces the toxicity and mobility of contaminants, and meets the identified goals with no decrease in effectiveness over time.
  - Reliability – Excavation and off-post treatment/disposal is effective over the long term and has been implemented effectively at many sites.
  - Implementability – This alternative is technically and administratively feasible at Building 619 (south alley). Excavation equipment is readily available, and a Subtitle C landfill and a TSDF are located within 100 miles of TEAD. Because Alternative 2 requires excavation to 3.5 feet bgs, the possible presence of subsurface utilities should be noted and might affect implementation. Approximately 1 week is required to complete the excavation, off-post treatment/disposal activities, and backfilling, and to meet the CAOs.
  - Safety – Alternative 2 poses moderate short-term risks to onsite workers and off-post residential communities during transport and off-post

treatment/disposal of the soil. Onsite workers may be exposed to contaminated soil during excavation and other soil-handling activities. However, the use of conventional safety measures, as well as other protective measures such as dust suppression and monitoring, minimize health risks to workers. Compliance with all applicable requirements for the transport of hazardous materials minimizes this risk and essentially eliminates the potential for community impacts.

- Human health assessment – Excavation and off-post treatment/disposal protect human health by preventing both short- and long-term exposure to contaminated soil.
- Environmental assessment – The SWERA (Rust E&I, 1997) identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 619 (south alley).
- Administrative feasibility – Alternative 2 complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101 and UAC R311-211. Because all soil containing TPHC levels above the CAOs is excavated and removed from the site, this alternative meets the human health risk criteria under UAC R315-101-6. The excavated soil is transported in accordance with DOT regulations.
- Cost – The estimated present worth cost of implementing Alternative 2 is \$22,800. Table A-13 (Appendix A) presents the detailed cost estimate.

#### 7.4.3 Comparative Analysis of Corrective Measures Alternatives

Table 7-8 and the text below summarize the comparative analysis of the two corrective measures alternatives identified for Building 619 (south alley).

- Technical criteria
  - Performance – Alternative 2 (excavation and off-post treatment/disposal) immediately reduces the mobility of TPHCs and achieves the target TPHC soil concentration of 10,000 µg/g (UDEQ, 1997) in less than 1 week. Under Alternative 1 (MNA), TPHC concentrations may be reduced to acceptable levels through natural degradation processes in 1 to 2 years. Alternative 2 provides a higher level of performance by immediately achieving both qualitative and quantitative objectives.

TABLE 7-8

Comparative Analysis of Corrective Measures Alternatives  
Used Oil Dumpsters (SWMU 46) – Building 619 (South Alley) (a)

Corrective Measures Alternatives	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
	Performance	Reliability	Implementability	Safety				
1. Monitored natural attenuation	Moderate	Moderate	Moderate	High	High	High	High	\$50,100
2. Excavation and off-post treatment/disposal	High	High	High	Moderate	High	High	High	\$22,800

(a) Rankings of high, moderate, or low indicate the effectiveness of each alternative in meeting the evaluation criteria, relative to other alternatives.

- Reliability – Each of the alternatives has been implemented successfully at other sites and is considered to be reliable. Alternative 2 requires no O&M or long-term monitoring; Alternative 1 requires minimal sampling and analysis to document natural attenuation. Some degree of long-term liability may be associated with Alternative 2.
- Implementability – Both of these alternatives can be readily implemented at Building 619 (south alley). The building is located within the Maintenance Area of TEAD and is part of the BRAC parcel. Alternatives 1 and 2 are rated high because equipment, materials, and contractors are readily available locally. It is estimated that Alternative 2 could be implemented within 1 week; Alternative 1 may take 1 to 2 years. Subsurface utilities may cause a problem for Alternatives 1 and 2 because of soil sampling/excavation at depths of 3.5 feet.
- Safety – Minimal risks are associated with sampling for Alternative 1 and excavation activities for Alternative 2; however, these risks are easily mitigated using conventional safety measures. The off-post transport of contaminated soil in Alternative 2 presents minor risks to off-post residential communities.
- Human health assessment – There are no unacceptable human health risks or HIs at Building 619 (south alley); however, the TPHC levels warrant action. Because Alternative 2 more efficiently removes TPHCs, it is more protective of overall human health.
- Environmental assessment – The sitewide ecological assessment identified no unacceptable risks to ecological receptors as a result of the contaminants in soil at Building 619 (south alley).
- Administrative feasibility – Alternative 2 readily meets the target concentration of 10,000 µg/g for TPHC-contaminated soil (UDEQ, 1997). Alternative 1 is expected to meet this requirement within 1 to 2 years of implementation. Alternative 2 is expected to meet UTSS for petroleum-contaminated soil before the soil is disposed in a landfill; it also complies with UAC R307-12. Both alternatives meet the requirements of UAC R315-101.
- Cost – The estimated costs of Alternatives 1 and 2 are \$50,100 and \$22,800, respectively.

#### 7.4.4 Recommended Corrective Measures Alternative

Based on the comparative analysis, Alternative 2 is recommended as the preferred alternative for Building 619 (south alley). It includes excavation and off-post treatment/disposal of TPHC-contaminated soil, and meets the CAOs identified at this site.

Because Alternative 2 is easily implemented, the time required to meet the quantitative CAO is not expected to be significant. It is likely to take a longer time for Alternative 1 to achieve the quantitative CAO. Alternative 2 is reliable, cost-effective, readily implementable, protective of human health and the environment, and meets the requirements of UAC R315-101.

## **8.0 SUMMARY OF RECOMMENDED CORRECTIVE MEASURES ALTERNATIVES**

Sections 3.0 through 7.0 present the detailed evaluations and comparative analyses of corrective measures alternatives for each Group B SWMU according to the CMS evaluation criteria. Table 8-1 summarizes the results of these analyses. The corrective measures alternatives for the Group B SWMU areas are listed below:

- Sandblast Areas (SWMU 4)
  - Building 600 – Deed restrictions
  - Buildings 615/617 – Deed restrictions.
- AED Demilitarization Test Facility (SWMU 19) – Land use restrictions.
- DRMO Storage Yard (SWMU 26) – Deed restrictions.
- Drum Storage Area (SWMU 29) – Deed restrictions.
- Used Oil Dumpsters (SWMU 46)
  - Building 522 (south end) – Excavation and off-post treatment/disposal.
  - Building 602 (southwest corner) – Excavation and off-post treatment/disposal.
  - Building 611 (northwest corner) – Excavation, off-post treatment/ disposal, and deed restrictions.
  - Building 619 (south alley) – Excavation and off-post treatment/disposal.

TABLE 8-1

Summary of Comparative Analysis of Corrective Measures Alternatives  
Group B Suspected Releases SWMUs

SWMU	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
Corrective Measures Alternatives	Performance	Reliability	Implementability	Safety				
Sandblast Areas (SWMU 4), Building 600								
Deed restrictions (a)	Meets identified CAOs	No O&M or long-term monitoring	Easily implemented under current conditions	No short-term risks	Protects human health	No effect (b)	Meets requirements of EPA and UAC R315-101	\$5,000
Sandblast Areas (SWMU 4), Buildings 615/617								
Deed restrictions (a)	Meets identified CAOs	No O&M or long-term monitoring	Easily implemented under current conditions	No short-term risks	Protects human health	No effect	Meets requirements of EPA and UAC R315-101	\$5,000
AED Demilitarization Test Facility (SWMU 19)								
Land use restrictions (a)	Meets identified CAOs	No O&M or long-term monitoring	Easily implemented under current conditions	No short-term risks	Protects human health	No effect	Meets requirements of EPA and UAC R315-101	\$5,000
DRMO Storage Yard (SWMU 26)								
Deed restrictions (a)	Meets identified CAOs	No O&M or long-term monitoring	Easily implemented under current conditions	No short-term risks	Protects human health	No effect	Meets requirements of EPA and UAC R315-101	\$5,000
Drum Storage Area (SWMU 29)								
Deed restrictions (a)	Meets identified CAOs	No O&M or long-term monitoring	Easily implemented under current conditions	No short-term risks	Protects human health	No effect	Meets requirements of EPA and UAC R315-101	\$5,000
Used Oil Dumpsters (SWMU 46), Building 522 (South End)								
Alternative 1 – Monitored natural attenuation	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 to 2 years	Annual O&M; effective over the long term and successfully implemented at other sites	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls	No effect (b)	No effect	Meets requirements of EPA and UAC R315-101; target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997) is likely met in 1 to 2 years	\$37,800
Alternative 2 – Excavation and off-post treatment/ disposal (a)	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 week	No O&M or long-term monitoring required; effective over the long term and successfully implemented at other sites; some degree of long-term liability	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls; off-post transport presents minor risks to off-post residential communities	Protects human health	No effect	Meets requirements of EPA and UAC R315-101; likely meets UTS before disposal in landfill; complies with UAC R307-12; meets target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997)	\$15,300

TABLE 8-1 (cont'd)

SWMU	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
Corrective Measures Alternatives	Performance	Reliability	Implementability	Safety				
Used Oil Dumpsters (SWMU 46), Building 602 (Southwest Corner)								
Alternative 1 – Monitored natural attenuation	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 to 2 years	Annual O&M; effective over the long term and successfully implemented at other sites	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls	No effect (b)	No effect	Meets requirements of EPA and UAC R315-101; target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997) is likely met in 1 to 2 years	\$37,800
Alternative 2 – Excavation and off-post treatment/ disposal (a)	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 week	No O&M or long-term monitoring required; effective over the long term and successfully implemented at other sites; some degree of long-term liability	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls; off-post transport presents minor risks to off-post residential communities	Protects human health	No effect	Meets requirements of EPA and UAC R315-101; likely meets UTS before disposal in landfill; complies with UAC R307-12; meets target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997)	\$22,600
Used Oil Dumpsters (SWMU 46), Building 611 (Northwest Corner)								
Alternative 1 – Monitored natural attenuation and deed restrictions	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 to 2 years	Annual O&M; effective over the long term and successfully implemented at other sites	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls	No effect (b)	No effect	Meets requirements of EPA and UAC R315-101; target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997) is likely met in 1 to 2 years	\$58,800
Alternative 2 – Excavation, off-post treatment/ disposal, and deed restrictions (a)	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 week	No O&M or long-term monitoring required; effective over the long term and successfully implemented at other sites; some degree of long-term liability	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls; off-post transport presents minor risks to off-post residential communities	Protects human health	No effect	Meets requirements of EPA and UAC R315-101; likely meets UTS before disposal in landfill; complies with UAC R307-12; meets target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997)	\$44,700



TABLE 8-1 (cont'd)

SWMU	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
Corrective Measures Alternatives	Performance	Reliability	Implementability	Safety				
Used Oil Dumpsters (SWMU 46), Building 619 (South Alley)								
Alternative 1 – Monitored natural attenuation	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 to 2 years	Annual O&M; effective over the long term and successfully implemented at other sites	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls	No effect (b)	No effect	Meets requirements of EPA and UAC R315-101; target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997) is likely met in 1 to 2 years	\$50,100
Alternative 2 – Excavation and off-post treatment/ disposal (a)	Meets identified qualitative CAOs; may achieve quantitative CAOs in 1 week	No O&M or long-term monitoring required; effective over the long term and successfully implemented at other sites; some degree of long-term liability	Easily implemented under current conditions	Minimal short-term risk to field workers mitigated by engineering and safety controls; off-post transport presents minor risks to off-post residential communities	Protects human health	No effect	Meets requirements of EPA and UAC R315-101; likely meets UTS before disposal in landfill; complies with UAC R307-12; meets target concentration of 10,000 µg/g for TPHCs in soil (UDEQ, 1997)	\$22,800

(a) Preferred alternative.

(b) The human health and ecological risk assessments showed no adverse conditions at the SWMU; this alternative will not affect that status.

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## **APPENDIX A**

### **Detailed Cost Estimates for Recommended Corrective Measures Alternatives**

## **COST ESTIMATING ASSUMPTIONS**

This appendix presents assumptions for the development of cost estimates for the corrective measures alternatives evaluated in Sections 3.0 to 7.0 of the main text. The cost estimates made for this CMS are anticipated to provide an accuracy of +50 to -30 percent based on available data and best engineering judgment.

### **A.1 DIRECT CAPITAL COST ASSUMPTIONS**

#### **A.1.1 LAND USE/DEED RESTRICTIONS**

- Includes legal and administrative costs associated with incorporating deed restrictions into the deed created for the transfer of the BRAC parcel from TEAD to the buyer.
- Includes legal and administrative costs associated with obtaining land use restrictions from the Army.

#### **A.1.2 SOIL OPERATIONS ACTIVITIES**

##### **A.1.2.1 Ground Preparation/Clearing**

- Includes equipment and labor necessary for clearing of site vegetation as needed prior to remedial activities. Also includes costs associated with mobilization and demobilization.

##### **A.1.2.2 Soil Excavation**

- Includes labor and equipment necessary for the excavation of contaminated soil from sites to a nearby staging area for treatment or disposal activities. Depth of excavation, which varies according to the site, is considered in the cost for each individual site. In general, the shallow excavation depths presented in this CMS do not require special safety measures such as shoring, access control, etc. Also includes costs associated with mobilization and demobilization.
- Includes costs for water tank rental and personnel to wet exposed soil areas to minimize dust generation during excavation/backfilling.

##### **A.1.2.3 Temporary Erosion Control**

- Includes materials, labor, and equipment necessary for temporary run-on and run-off control as a means of erosion control during remedial activities. Also includes costs associated with mobilization and demobilization. Does not

include permanent erosion control measures such as revegetation, which is included under a separate line item.

A.1.2.4 Backfilling

- Includes costs associated with hauling free backfill from on post (distance less than 6 miles), backfilling of excavated areas and compaction, as necessary. Also includes costs associated with mobilization and demobilization.

A.1.2.5 Grading

- Includes equipment and labor needed for grading the surface of the site subsequent to remedial activities to minimize ponding and erosion. Also includes costs associated with mobilization and demobilization.

A.1.2.6 Revegetation/Seeding

- Includes equipment, materials, and labor required for vegetation/seeding of the site. Assumes that the site has been previously cleared and major landscaping is not required. Indigenous vegetation will be used. Soil amendment, as necessary, is included. Also includes costs associated with mobilization and demobilization.

A.1.3 CHEMICAL ANALYSES

A.1.3.1 Confirmation Sampling

- Includes labor, materials, and laboratory fees associated with collection, shipment, and chemical analysis of surface and subsurface soils samples.
- Assumes that two personnel conduct sampling. Number of samples collected is determined as at least 10 percent of the cubic yards of soil excavated or remediated.

A.1.3.2 Soil Profile and Analytical Costs

- Includes costs associated with conducting a soil profile and soil analysis, which are required prior to off-post landfill disposal as part of the waste acceptance criteria of the disposal site. Labor, equipment, shipment, and laboratory analysis are included. Number of samples collected is determined as at least 1 sample and at least 1 percent of the cubic yards of soil excavated or remediated.

#### A.1.3.3 Residual Profile and Analytical Costs

- Includes costs associated with conducting a treatment residuals profile and analysis, which are required prior to off-post landfill disposal as part of the WAC. Labor, equipment, shipment, and laboratory analysis are included.

#### A.1.4 DISPOSAL

##### A.1.4.1 Transportation to Landfill

- Includes costs associated with transportation of wastes from the site to an off-post RCRA-approved landfill. Use of appropriately permitted commercial transportation vendors is assumed.

##### A.1.4.2 Landfill Disposal

- Includes costs associated with off-post disposal at an appropriate RCRA-permitted landfill. Results of confirmation sampling and soil profiling will be used to determine appropriate destinations for excavated materials (Subtitle C TSDF or Subtitle C landfill). Disposal costs assumed in remedial alternatives could change significantly if confirmation sampling determines that soil can be disposed of at a less protective class landfill.

### **A.2 INDIRECT CAPITAL COST ASSUMPTIONS**

#### A.2.1 ENGINEERING AND CONSTRUCTION MANAGEMENT

- Costs associated with providing technical engineering support during the design and construction phases of various remedial activities are assumed to be 20 percent of total direct costs.

#### A.2.2 HEALTH AND SAFETY EQUIPMENT AND TRAINING

- Costs associated with providing health and safety equipment and training for use during remediation activities are assumed to be 5 percent of total direct costs.

#### A.2.3 LEGAL AND ADMINISTRATIVE

- Costs associated with any legal and administrative issues associated with implementation of the remedial action – such as coordination with Federal, State, and local agencies; landowners; and other authorities – are assumed to be 5 percent of total direct costs.

#### A.2.4 PROJECT MANAGEMENT

- Costs associated with providing technical direction, quality control, monthly progress reports, and invoice generation for the project are assumed to be 10 percent of total direct costs.

### **A.3 OTHER ASSUMPTIONS**

The following are other general assumptions for development of cost estimates.

- The volume of soil after excavation is 25 percent greater than the volume to be excavated (i.e., no longer compacted).
- Each cubic yard of soil excavated is approximately 1.4 tons (based on density of 1.66 g/cm<sup>3</sup>).
- The amount of residual soil to be landfilled after soil washing is 15 percent of that washed.
- For present worth calculations, the discount rate is 7 percent based on OSWER Directive No. 9355.3-20.
- The contingency cost is 20 percent of the subtotal cost of the alternative.

### **A.4 DETAILED COST ESTIMATES**

Tables A-1 to A-13 summarize cost estimates for each alternative at each SWMU in Group B.



**Table A-1**  
**SWMU 4 (Building 600) - Alternative 1: Deed Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Deed restrictions	1	ls	\$ 5,000.00	\$ 5,000
<b>Subtotal Direct Capital Costs</b>				<b>\$ 5,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 5,000</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 5,000</b>
<b>Contingency (@ 20%)</b>				
<b>Total Cost Of Alternative</b>				<b>\$ 5,000</b>

*Key to unit abbreviations*

<i>ls</i>	lump sum
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**Table A-2**  
**SWMU 4 (Buildings 615/617) - Alternative 1: Deed Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Deed restrictions	1	ls	\$ 5,000.00	\$ 5,000
<b>Subtotal Direct Capital Costs</b>				<b>\$ 5,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 5,000</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 5,000</b>
<b>Contingency (@ 20%)</b>				
<b>Total Cost Of Alternative</b>				<b>\$ 5,000</b>

*Key to unit abbreviations*

<i>ls</i>	lump sum
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**Table A-3**  
**SWMU 19 - Alternative 1: Land Use Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Land use restrictions	1	ls	\$ 5,000.00	\$ 5,000
<b>Subtotal Direct Capital Costs</b>				<b>\$ 5,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 5,000</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				
<b>Subtotal Cost Of Alternative</b>				<b>\$ 5,000</b>
<b>Contingency (@ 20%)</b>				
<b>Total Cost Of Alternative</b>				<b>\$ 5,000</b>

*Key to unit abbreviations*  
 ls                      lump sum

**Table A-4**  
**SWMU 26 - Alternative 1: Deed Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Deed restrictions	1	ls	\$ 5,000.00	\$ 5,000
<b>Subtotal Direct Capital Costs</b>				<b>\$ 5,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 5,000</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 5,000</b>
<b>Contingency (@ 20%)</b>				
<b>Total Cost Of Alternative</b>				<b>\$ 5,000</b>

*Key to unit abbreviations*

*ls*                      lump sum

**Table A-5**  
**SWMU 29 - Alternative 1: Deed Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Deed restrictions	1	ls	\$ 5,000.00	\$ 5,000
<b>Subtotal Direct Capital Costs</b>				<b>\$ 5,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 5,000</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 5,000</b>
<b>Contingency (@ 20%)</b>				
<b>Total Cost Of Alternative</b>				<b>\$ 5,000</b>

*Key to unit abbreviations*

*ls*                      lump sum

**Table A-6**  
**SWMU 46 (Building 522) - Alternative 1: Monitored Natural Attenuation (MNA) Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
<b>Initial and Quarterly Site Review</b>				
TPHC Sampling	4	sample	\$ 80.00	\$ 400
MNA Sampling <sup>(1)</sup>	4	sample	\$ 100.00	\$ 400
Field Sampling Personnel	16	hour	\$ 65.00	\$ 1,100
Project Management & Letter Report	20	hour	\$ 80.00	\$ 1,600
<b>Subtotal Direct Capital Costs</b>				<b>\$ 3,500</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 3,500</b>
<b>Annual O&amp;M Direct Costs</b>				
Site review <sup>(2)</sup>	4	ea	\$ 3,500.00	\$ 14,000
<b>Subtotal Annual O&amp;M Direct Costs</b>				<b>\$ 14,000</b>
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (2 yrs @ 7% discount rate)</b>				<b>28,000</b>
<b>Total Present Worth O&amp;M Costs (2 yrs @ 7% discount rate)</b>				<b>\$ 28,000</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 31,500</b>
<b>Contingency (@ 20%)</b>				<b>\$ 6,300</b>
<b>Total Cost Of Alternative</b>				<b>\$ 37,800</b>

(1) Includes pH, moisture content, and permeability.

(2) Assumes collection of a minimum of three soil samples from the site, laboratory analysis, data reduction and preparation of a letter report

Key to unit abbreviations

<i>ls</i>	lump sum
<i>sample</i>	per sample

**Table A-7**  
**SWMU 46 (Building 522) - Alternative 2: Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing*	11	sy	\$ 0.20	\$ 1,100
Soil Excavation	4	cy	\$ 20.00	\$ 100
Backfilling/Compacting Clean Soil	4	cy	\$ 10.00	\$ 100
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	4	cy	\$ 112.00	\$ 500
TSDF/Landfill Disposal Cost	10	ton	\$ 322.00	\$ 3,300
Grading*	1.0	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding*	11	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 9,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 1,800
Health and Safety Equipment & Training (5% of direct costs)				\$ 500
Legal and Administrative (5% of direct costs)				\$ 500
Project Management (10% of direct costs)				\$ 900
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 3,700</b>
<b>Total Capital Costs</b>				<b>\$ 12,700</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				
<b>Subtotal Cost Of Alternative</b>				<b>\$ 12,700</b>
<b>Contingency (@ 20%)</b>				<b>\$ 2,600</b>
<b>Total Cost Of Alternative</b>				<b>\$ 15,300</b>

\* The total cost for these items include \$1000 mobilization/demobilization cost.

**Key to unit abbreviations**

cy	cubic yard
load	per load
msf	thousand square feet
sample	per sample
sy	square yard
ton	per US ton

Table A-8

SWMU 46 (Building 602) - Alternative 1: *Monitored Natural Attenuation (MNA)* Cost Estimate

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
<b>Initial and Quarterly Site Review</b>				
TPHC Sampling	4	sample	\$ 80.00	\$ 400
MNA Sampling <sup>(1)</sup>	4	sample	\$ 100.00	\$ 400
Field Sampling Personnel	16	hour	\$ 65.00	\$ 1,100
Project Management & Letter Report	20	hour	\$ 80.00	\$ 1,600
<b>Subtotal Direct Capital Costs</b>				<b>\$ 3,500</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				
<b>Total Capital Costs</b>				<b>\$ 3,500</b>
<b>Annual O&amp;M Direct Costs</b>				
Site review <sup>(2)</sup>	4	ea	\$ 3,500.00	\$ 14,000
<b>Subtotal Annual O&amp;M Direct Costs</b>				<b>\$ 14,000</b>
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (2 yrs @ 7% discount rate)</b>				<b>28,000</b>
<b>Total Present Worth O&amp;M Costs (2 yrs @ 7% discount rate)</b>				<b>\$ 28,000</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 31,500</b>
Contingency (@ 20%)				\$ 6,300
<b>Total Cost Of Alternative</b>				<b>\$ 37,800</b>

(1) Includes pH, moisture content, and permeability.

(2) Assumes collection of a minimum of three soil samples from the site, laboratory analysis, data reduction and preparation of a letter report

*Key to unit abbreviations*

<i>ls</i>	lump sum
<i>sample</i>	per sample



**Table A-9**  
**SWMU 46 (Building 602) - Alternative 2: Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing*	33	sy	\$ 0.20	\$ 1,100
Soil Excavation	11	cy	\$ 20.00	\$ 300
Backfilling/Compacting Clean Soil	11	cy	\$ 10.00	\$ 200
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	11	cy	\$ 112.00	\$ 1,300
TSDF/Landfill Disposal Cost	20	ton	\$ 322.00	\$ 6,500
Grading*	1.0	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding*	33	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 13,300</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 2,700
Health and Safety Equipment & Training (5% of direct costs)				\$ 700
Legal and Administrative (5% of direct costs)				\$ 700
Project Management (10% of direct costs)				\$ 1,400
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 5,500</b>
<b>Total Capital Costs</b>				<b>\$ 18,800</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				
<b>Subtotal Cost Of Alternative</b>				<b>\$ 18,800</b>
<b>Contingency (@ 20%)</b>				<b>\$ 3,800</b>
<b>Total Cost Of Alternative</b>				<b>\$ 22,600</b>

\* The total cost for these items include \$1000 mobilization/demobilization cost.

**Key to unit abbreviations**

cy	cubic yard
load	per load
msf	thousand square feet
sample	per sample
sy	square yard
ton	per US ton

**Table A-10**  
**SWMU 46 (Building 611)**

**Alternative 1: Monitored Natural Attenuation (MNA) and Deed Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Deed Restrictions	1	ea	\$5,000.00	\$ 5,000
<b>Initial and Quarterly Site Review</b>				
TPHC Sampling	4	sample	\$ 80.00	\$ 400
MNA Sampling <sup>(1)</sup>	4	sample	\$ 100.00	\$ 400
Drilling for subsurface sample	10	hour	\$ 150.00	\$ 1,500
Field Sampling Personnel	16	hour	\$ 65.00	\$ 1,100
Project Management & Letter Report	20	hour	\$ 80.00	\$ 1,600
<b>Subtotal Direct Capital Costs</b>				<b>\$ 10,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				<b>-</b>
<b>Total Capital Costs</b>				<b>\$ 10,000</b>
<b>Annual O&amp;M Direct Costs</b>				
Site review <sup>(2)</sup>	4	year	\$ 5,000.00	\$ 20,000
<b>Subtotal Annual O&amp;M Direct Costs</b>				<b>\$ 20,000</b>
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (2 yrs @ 7% discount rate)</b>				<b>39,000</b>
<b>Total Present Worth O&amp;M Costs (2 yrs @ 7% discount rate)</b>				<b>\$ 39,000</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 49,000</b>
<b>Contingency (@ 20%)</b>				<b>\$ 9,800</b>
<b>Total Cost Of Alternative</b>				<b>\$ 58,800</b>

(1) Includes pH, moisture content, and permeability.

(2) Assumes collection of a minimum of three soil samples from the site, laboratory analysis, data reduction and preparation of a letter report.

**Key to unit abbreviations**

<i>ea</i>	each
<i>ls</i>	lump sum
<i>sample</i>	per sample

**Table A-11**  
**SWMU 46 (Building 611)**

**Alternative 2: Excavation and Off-post Treatment/Disposal and Deed Restrictions Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Deed Restrictions	1	ea	\$5,000.00	\$ 5,000
Ground Preparation/Clearing*	44	sy	\$ 0.20	\$ 1,100
Soil Excavation <sup>(1)</sup>	24	cy	\$ 20.00	\$ 500
Backfilling/Compacting Clean Soil	24	cy	\$ 10.00	\$ 300
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	24	cy	\$ 112.00	\$ 2,700
TSDF/Landfill Disposal Cost	40	ton	\$ 322.00	\$ 12,900
Grading*	1.0	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding*	44	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 26,400</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 5,300
Health and Safety Equipment & Training (5% of direct costs)				\$ 1,400
Legal and Administrative (5% of direct costs)				\$ 1,400
Project Management (10% of direct costs)				\$ 2,700
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 10,800</b>
<b>Total Capital Costs</b>				<b>\$ 37,200</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				
<b>Subtotal Cost Of Alternative</b>				<b>\$ 37,200</b>
<b>Contingency (@ 20%)</b>				<b>\$ 7,500</b>
<b>Total Cost Of Alternative</b>				<b>\$ 44,700</b>

(1) 3 samples will be excavated to a depth of 1 foot bgs, and 1 sample will be excavated to a depth of 3.5 feet bgs.

\* The total cost for these items include \$1000 mobilization/demobilization cost.

**Key to unit abbreviations**

cy	cubic yard
load	per load
msf	thousand square feet
sample	per sample
sy	square yard
ton	per US ton

Table A-12

## SWMU 46 (Building 619) - Alternative 1: Monitored Natural Attenuation (MNA) Cost Estimate

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
<b>Initial and Quarterly Site Review</b>				
TPHC Sampling	4	sample	\$ 80.00	\$ 400
MNA Sampling <sup>(1)</sup>	4	sample	\$ 100.00	\$ 400
Drilling for subsurface sample	8	hour	\$ 150.00	\$ 1,200
Field Sampling Personnel	16	hour	\$ 65.00	\$ 1,100
Project Management & Letter Report	20	hour	\$ 80.00	\$ 1,600
<b>Subtotal Direct Capital Costs</b>				<b>\$ 4,700</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				
Health and Safety Equipment & Training (5% of direct costs)				
Legal and Administrative (5% of direct costs)				
Project Management (10% of direct costs)				
<b>Subtotal Indirect Capital Costs</b>				
<b>Total Capital Costs</b>				<b>\$ 4,700</b>
<b>Annual O&amp;M Direct Costs</b>				
Site review <sup>(2)</sup>	4	ea	\$ 4,700.00	\$ 18,800
<b>Subtotal Annual O&amp;M Direct Costs</b>				<b>\$ 18,800</b>
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (2 yrs @ 7% discount rate)</b>				<b>37,000</b>
<b>Total Present Worth O&amp;M Costs (2 yrs @ 7% discount rate)</b>				<b>\$ 37,000</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 41,700</b>
<b>Contingency (@ 20%)</b>				<b>\$ 8,400</b>
<b>Total Cost Of Alternative</b>				<b>\$ 50,100</b>

(1) Includes pH, moisture content, and permeability.

(2) Assumes collection of a minimum of three soil samples from the site, laboratory analysis, data reduction and preparation of a letter report

Key to unit abbreviations

ls	lump sum
sample	per sample

**Table A-13**  
**SWMU 46 (Building 619) - Alternative 2: Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing*	11	sy	\$ 0.20	\$ 1,100
Soil Excavation <sup>(1)</sup>	13	cy	\$ 20.00	\$ 300
Backfilling/Compacting Clean Soil	13	cy	\$ 10.00	\$ 200
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	13	cy	\$ 112.00	\$ 1,500
TSDF/Landfill Disposal Cost	20	ton	\$ 322.00	\$ 6,500
Grading*	1.0	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding*	11	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 13,500</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 2,700
Health and Safety Equipment & Training (5% of direct costs)				\$ 700
Legal and Administrative (5% of direct costs)				\$ 700
Project Management (10% of direct costs)				\$ 1,400
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 5,500</b>
<b>Total Capital Costs</b>				<b>\$ 19,000</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				
<b>Subtotal Cost Of Alternative</b>				<b>\$ 19,000</b>
<b>Contingency (@ 20%)</b>				<b>\$ 3,800</b>
<b>Total Cost Of Alternative</b>				<b>\$ 22,800</b>

(1) One sample is excavated to a depth of 3.5 feet bgs.

\* The total cost for these items include \$1000 mobilization/demobilization cost.

**Key to unit abbreviations**

cy	cubic yard
load	per load
msf	thousand square feet
sample	per sample
sy	square yard
ton	per US ton

## **APPENDIX B**

### **Detailed Cost Estimates for Unrestricted Use Corrective Measures**

## INTRODUCTION

Recent Army guidance focuses on the application of institutional controls (ICs) at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites. The guidance is presented in the memorandum “Army Guidance on Using Institutional Controls (ICs) in the CERCLA Process,” issued on September 4, 1998, by the Assistant Chief of Staff for Installation Management, Department of the Army (U.S. Army, 1998). Although the guidance is primarily directed to ICs in relation to Base Realignment and Closure (BRAC) transfers, it also presents general principles applicable to active military installations. Appendix E of the CMS Work Plan (Dames & Moore, 2000) provides a brief explanation of the Army policy regarding ICs and implements the guidance at selected Group B solid waste management units (SWMUs).

To comply with the recent Army guidance, a corrective measure that remediates a site so that it is suitable for unrestricted use is evaluated for SWMUs 4, 19, 26, and 29 in the CMS Work Plan. This corrective measure includes excavation of contaminated soil and off-post treatment/disposal. This applies to all soil that:

- Contains COCs at concentrations above residential CAOs.
- Poses a cancer risk above  $1 \times 10^{-6}$ .
- Poses a noncancer hazard index (HI) greater than 1.0.
- Results in a blood lead level above 10 micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ) for children ( $11.1 \mu\text{g}/\text{dL}$  for adults).

The excavation and off-post treatment/disposal corrective measure includes provisions for confirmation sampling to ensure that the soil contaminated at levels above CAOs is removed.

The goal of the following evaluation is primarily intended to provide a comparison of long-term costs of remediation versus ICs.

### **B.1 SANDBLAST AREAS (SWMU 4, BUILDING 600)**

#### **B.1.1 Cost Comparison**

The estimated cost of implementing excavation and off-post treatment/disposal without institutional controls for  $11 \text{ yd}^3$  of the contaminated soil at SWMU 4, Building 600 is \$23,600. The attached table (Table B-1) presents the detailed cost estimate. The estimated cost of implementing an alternative with ICs (Alternative 1, Table A-1) is \$5,000. See Appendix A for that cost table.

### B.1.2 Summary

- Based on a comparison with CAOs and EPCs, lead is identified as the residential COC at Building 600 that requires remediation.
- Lead, benzo(a)pyrene, and bis(2-ethylhexyl)phthalate pose unacceptable residential human health risks.
- Approximately 11 yd<sup>3</sup> of soil requires corrective action to allow for unrestricted use.
- The cost of implementing ICs (\$5,000) is less than the cost of excavation and off-post treatment/disposal (\$23,600).

## **B.2 SANDBLAST AREAS (SWMU 4, BUILDINGS 615/617)**

### B.2.1 Cost Comparison

The estimated cost of implementing excavation and off-post treatment/disposal without institutional controls for 41 yd<sup>3</sup> of the contaminated soil at SWMU 4, Buildings 615/617 is \$53,300. The attached table (Table B-2) presents the detailed cost estimate. The estimated cost of implementing an alternative with ICs (Alternative 1, Table A-2) is \$5,000. See Appendix A for that cost table.

### B.2.2 Summary

- Based on a comparison with CAOs and EPCs, lead and benzo(a)pyrene are identified as the COCs at Buildings 615/617 that require remediation.
- Lead, benzo(a)pyrene, and bis(2-ethylhexyl)phthalate pose unacceptable residential human health risks.
- Approximately 41 yd<sup>3</sup> of soil requires corrective action to allow for unrestricted use.
- The cost of implementing ICs (\$5,000) is less than the cost of excavation and off-post treatment/disposal (\$53,300).

## **B.3 AED DEMILITARIZATION TEST FACILITY (SWMU 19)**

### B.3.1 Cost Comparison

The estimated cost of implementing excavation and off-post treatment/disposal without institutional controls for 15 yd<sup>3</sup> of the contaminated soil at SWMU 19 is \$26,800.



The attached table (Table B-3) presents the detailed cost estimate. The estimated cost of implementing an alternative with ICs (Alternative 1, Table A-3) is \$5,000. See Appendix A for that cost table.

#### B.3.2 Summary

- Based on a comparison with CAOs and EPCs, no residential COCs that require an evaluation of corrective action were identified for SWMU 19.
- RDX and bis(2-ethylhexyl)phthalate drive a health risk to hypothetical future residents, primarily via the dermal adsorption pathway.
- Approximately 15 yd<sup>3</sup> of soil requires corrective action to allow for unrestricted use.
- The cost of implementing ICs (\$5,000) is less than the cost of excavation and off-post treatment/disposal (\$26,800).

### **B.4 DRMO STORAGE YARD (SWMU 26)**

#### B.4.1 Cost Comparison

The estimated cost of implementing excavation and off-post treatment/disposal without institutional controls for 11 yd<sup>3</sup> of the contaminated soil at SWMU 26 is \$23,600. The attached table (Table B-4) presents the detailed cost estimate. The estimated cost of implementing an alternative with ICs (Alternative 1, Table A-4) is \$5,000. See Appendix A for that cost table.

#### B.4.2 Summary

- Based on a comparison with CAOs and EPCs, PAHs are identified as the residential COCs at SWMU 26 that require an evaluation of corrective action.
- The three PAH COCs, antimony, cadmium, thallium (present below background levels), and lead pose an unacceptable health risk to hypothetical future residents.
- Approximately 11 yd<sup>3</sup> of soil requires corrective action to allow for unrestricted use.
- The cost of implementing ICs (\$5,000) is less than the cost of excavation and off-post treatment/disposal (\$23,600).

## **B.5 DRUM STORAGE AREA (SWMU 29)**

### **B.5.1 Cost Comparison**

The estimated cost of implementing excavation and off-post treatment/disposal without institutional controls for 4 yd<sup>3</sup> of the contaminated soil at SWMU 29 is \$16,500. The attached table (Table B-5) presents the detailed cost estimate. The estimated cost of implementing an alternative with ICs (Alternative 1, Table A-5) is \$5,000. See Appendix A for that cost table.

### **B.5.2 Summary**

- Based on CAOs, no residential COCs that require an evaluation of corrective action were identified for SWMU 29.
- Benzo(a)pyrene and thallium (present below background levels) drive a health risk to hypothetical future residents.
- Approximately 4 yd<sup>3</sup> of soil requires corrective action to allow for unrestricted use.
- The cost of implementing ICs (\$5,000) is less than the cost of excavation and off-post treatment/disposal (\$16,500).

**Table B-1**  
**SWMU 4 (Building 600) Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing	33	sy	\$ 0.20	\$ 1,100
Soil Excavation	11	cy	\$ 20.00	\$ 1,300
Backfill	11	cy	\$ 10.00	\$ 1,200
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	11	cy	\$ 112.00	\$ 1,300
TSDF/Landfill Disposal Cost	16	ton	\$ 322.00	\$ 5,200
Grading	1	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding	33	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 14,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 2,800
Health and Safety Equipment & Training (5% of direct costs)				\$ 700
Legal and Administrative (5% of direct costs)				\$ 700
Project Management (10% of direct costs)				\$ 1,400
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 5,600</b>
<b>Total Capital Costs</b>				<b>\$ 19,600</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				-
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				-
<b>Subtotal Cost Of Alternative</b>				<b>\$ 19,600</b>
<b>Contingency (@ 20%)</b>				<b>\$ 4,000</b>
<b>Total Cost Of Alternative</b>				<b>\$ 23,600</b>

**Key to unit abbreviations**

cy	cubic yard
load	per load
ls	lump sum
msf	thousand square feet
sample	per sample
sy	square yard
ton	per US ton

**Table B-2**  
**SWMU 4 (Buildings 615/617) Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing	122	sy	\$ 0.20	\$ 1,100
Soil Excavation	41	cy	\$ 20.00	\$ 1,900
Backfill	41	cy	\$ 10.00	\$ 1,500
Confirmation Sampling	5	sample	\$ 115.00	\$ 600
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	41	cy	\$ 112.00	\$ 4,600
TSDF/Landfill Disposal Cost	57	ton	\$ 322.00	\$ 18,400
Grading	2	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding	122	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 31,600</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 6,400
Health and Safety Equipment & Training (5% of direct costs)				\$ 1,600
Legal and Administrative (5% of direct costs)				\$ 1,600
Project Management (10% of direct costs)				\$ 3,200
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 12,800</b>
<b>Total Capital Costs</b>				<b>\$ 44,400</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 44,400</b>
<b>Contingency (@ 20%)</b>				<b>\$ 8,900</b>
<b>Total Cost Of Alternative</b>				<b>\$ 53,300</b>

**Key to unit abbreviations**

cy	cubic yard
load	per load
ls	lump sum
msf	thousand square feet
sample	per sample
sy	square yard
ton	per US ton

**Table B-3**  
**SWMU 19 Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing	44	sy	\$ 0.20	\$ 1,100
Soil Excavation	15	cy	\$ 20.00	\$ 1,300
Backfill	15	cy	\$ 10.00	\$ 1,200
Confirmation Sampling	2	sample	\$ 115.00	\$ 300
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	15	cy	\$ 112.00	\$ 1,700
TSDF/Landfill Disposal Cost	21	ton	\$ 322.00	\$ 6,800
Grading	1	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding	44	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 15,900</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 3,200
Health and Safety Equipment & Training (5% of direct costs)				\$ 800
Legal and Administrative (5% of direct costs)				\$ 800
Project Management (10% of direct costs)				\$ 1,600
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 6,400</b>
<b>Total Capital Costs</b>				<b>\$ 22,300</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				
<b>Subtotal Cost Of Alternative</b>				<b>\$ 22,300</b>
<b>Contingency (@ 20%)</b>				<b>\$ 4,500</b>
<b>Total Cost Of Alternative</b>				<b>\$ 26,800</b>

**Key to unit abbreviations**

<i>cy</i>	cubic yard
<i>load</i>	per load
<i>ls</i>	lump sum
<i>msf</i>	thousand square feet
<i>sample</i>	per sample
<i>sy</i>	square yard
<i>ton</i>	per US ton

**Table B-4**  
**SWMU 26 Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing	33	sy	\$ 0.20	\$ 1,100
Soil Excavation	11	cy	\$ 20.00	\$ 1,300
Backfill	11	cy	\$ 10.00	\$ 1,200
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSD/ Landfill	11	cy	\$ 112.00	\$ 1,300
TSD/ Landfill Disposal Cost	16	ton	\$ 322.00	\$ 5,200
Grading	1	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding	33	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 14,000</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 2,800
Health and Safety Equipment & Training (5% of direct costs)				\$ 700
Legal and Administrative (5% of direct costs)				\$ 700
Project Management (10% of direct costs)				\$ 1,400
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 5,600</b>
<b>Total Capital Costs</b>				<b>\$ 19,600</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 19,600</b>
<b>Contingency (@ 20%)</b>				<b>\$ 4,000</b>
<b>Total Cost Of Alternative</b>				<b>\$ 23,600</b>

**Key to unit abbreviations**

<i>cy</i>	cubic yard
<i>load</i>	per load
<i>ls</i>	lump sum
<i>msf</i>	thousand square feet
<i>sample</i>	per sample
<i>sy</i>	square yard
<i>ton</i>	per US ton

**Table B-5**  
**SWMU 29 Excavation and Off-post Treatment/Disposal Cost Estimate**

Activity	Quantity	Unit	Unit Cost	Total Cost
<b>Direct Capital Costs</b>				
Ground Preparation/Clearing	11	sy	\$ 0.20	\$ 1,100
Soil Excavation	4	cy	\$ 20.00	\$ 1,100
Backfill	4	cy	\$ 10.00	\$ 1,100
Confirmation Sampling	3	sample	\$ 115.00	\$ 400
Soil Profile & Analytical Costs	1	sample	\$ 1,300.00	\$ 1,300
Transport to Subtitle C TSDF/Landfill	4	cy	\$ 112.00	\$ 500
TSDF/Landfill Disposal Cost	6	ton	\$ 322.00	\$ 2,000
Grading	1	msf	\$ 48.00	\$ 1,100
Revegetation/Seeding	11	sy	\$ 0.22	\$ 1,100
<b>Subtotal Direct Capital Costs</b>				<b>\$ 9,700</b>
<b>Indirect Capital Costs</b>				
Engineering and Construction Management (20% of direct costs)				\$ 2,000
Health and Safety Equipment & Training (5% of direct costs)				\$ 500
Legal and Administrative (5% of direct costs)				\$ 500
Project Management (10% of direct costs)				\$ 1,000
<b>Subtotal Indirect Capital Costs</b>				<b>\$ 4,000</b>
<b>Total Capital Costs</b>				<b>\$ 13,700</b>
<b>Annual O&amp;M Direct Costs</b>				
<b>Subtotal Annual O&amp;M Direct Costs</b>				
<b>Other O&amp;M Direct Costs</b>				
<b>Subtotal Other O&amp;M Direct Costs</b>				
<b>Present Worth O&amp;M Direct Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Total Present Worth O&amp;M Costs (30 yrs @ 7% discount rate)</b>				<b>-</b>
<b>Subtotal Cost Of Alternative</b>				<b>\$ 13,700</b>
<b>Contingency (@ 20%)</b>				<b>\$ 2,800</b>
<b>Total Cost Of Alternative</b>				<b>\$ 16,500</b>

**Key to unit abbreviations**

<i>cy</i>	cubic yard
<i>load</i>	per load
<i>ls</i>	lump sum
<i>msf</i>	thousand square feet
<i>sample</i>	per sample
<i>sy</i>	square yard
<i>ton</i>	per US ton